

*A project funded by the United Nations Development Programme/Global Environment Facility (UNDP/GEF) and executed by the United Nations Office for Project Services (UNOPS)*

**SOCIO-ECONOMIC SPECIAL STUDY  
Report No. 17**

**TANZANIA**

**Final Report**

*Dar es Salaam  
June 2000*

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**Pollution control and other measures to protect biodiversity  
in Lake Tanganyika (RAF/92/G32)**

**Lutte contre la pollution et autres mesures visant à protéger  
la biodiversité du lac Tanganyika (RAF/92/G32)**

The Lake Tanganyika Biodiversity Project has been formulated to help the four riparian states (Burundi, Congo, Tanzania and Zambia) produce an effective and sustainable system for managing and conserving the biodiversity of Lake Tanganyika into the foreseeable future. It is funded by the Global Environmental Facility through the United Nations Development Programme.

Le Projet sur la Biodiversité du Lac Tanganyika a été formulé pour aider les quatre états riverains (Burundi, Congo, Tanzanie et Zambie) à élaborer un système efficace et durable pour gérer et conserver la diversité biologique du lac Tanganyika dans un avenir prévisible. Il est financé par le FEM (Fonds pour l'Environnement Mondial) par le biais du Programme des Nations Unies pour le Développement (PNUD)

**Burundi: L'Institut National pour l'Environnement et la Conservation de la Nature**

**D R Congo: Le Ministère de l'Environnement et de la Conservation de la Nature**

**Tanzania: Vice President's Office, Division of Environment**

**Zambia: Environment Council of Zambia**



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## **ACKNOWLEDGEMENTS**

This report synthesises the results a series of socio-economic surveys undertaken along the Tanzanian portion of the Lake Tanganyika shore and in its catchment under the auspices of the Lake Tanganyika Biodiversity Project. I am grateful to Mr Bahati Barongo at the Kigoma Station for his administrative and logistical support throughout.

The Project is heavily indebted to the many people who executed the research; suffice to name a few: Dr. Philippe Petit, Fishing Practices Consultant, MRAG; Mr. Steve Evison, Environmental Education Consultant, NRI; Mr. Bartholomew Tarimo, National Environmental Education Co-ordinator, NEMC; Mr. Omari Kashushu, Research Officer, TAFIRI; Mr. Hamza Mabochi, Mrs. Eunice Salamba, Ms. Esther Ntirugelegwa, and Ms Dinnah Peter, Community Development Officers, Kigoma; Mrs. Beatrice Marwa, Fisheries Officer, Kigoma; Mr. Vissa Magige, Regional Agricultural Officer, Kigoma; Mr. Malore Shaaban, District Agricultural Officer, Kigoma; Mr. Aristides Kashula, Forestry Co-ordinator, Mr Amani Kingu, Agricultural Co-ordinator, Mr. Moshi Sanze, Agricultural Extension Officer, and Mr. Rueben Mfanga, Agricultural Extension Officer, TACARE; Mr. Fredrick Malisa, Community Conservation Warden, Mahale Mountains National Park; Mr. Felix Eliadori, Fisheries Officer, Nkansi; Mrs. Pendo Malabeja, Community Development Officer, Sumbawanga; Mr. Peter Mgalla, Divisional Executive Officer, Kirando; Mr. Gerald Sangu, Community Development Officer, Kirando; Mr. Robert Kalyata, Agricultural Officer, Kirando; Ms. Dotto Mwinyikambi, Women's Representative, Kirando; Mr. Enock Mwamfupe, Ward Executive Officer, Buhingu, and finally the late Dr C.M.F Lwoga, the first National Socio-Economics Co-ordinator.

Acknowledgement and appreciation are due to the SESS Co-ordinator, Dr Kate Meadows, and the SESS Facilitator, Ms. Karen Zwick, who assisted with training, methodologies, and final report editing and production.

Finally, many thanks are due to the residents of the lakeshore and catchment communities who so generously gave their time.

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## **SUMMARY**

### **0.1 Introduction**

Since January, 1997 the socio-economics SS in Tanzania has undertaken participatory research at selected sites with the objectives of improving the understanding of:

- livelihood strategies of local communities, as a basis for informed intervention
- patterns of natural resource utilisation, and the threats to natural resources and biodiversity;
- the socio-economic make-up of lakeshore communities and the key stakeholder groups; and
- institutional mechanisms whereby improved resource management and local development initiatives might be introduced.

The study area included both lakeshore communities along the length of the Tanzanian coastline, and those in the wider catchment, although the effects of human activities there on the lake are largely thought to be mitigated by the extensive wetlands and delta of the Malagarasi. As such, it covered a diverse range of environmental and socio-cultural conditions, with often contrasting results from different areas.

The first PRA investigation was at Mtanga village in the vicinity of Gombe National Park in January, 1997. A second PRA was done in four lakeshore villages in Kirando Ward of Nkansi District, Rukwa Region. A third PRA exercise was done in Buhingu Ward, Kigoma District. Two social surveys were conducted in selected areas in the districts of Kigoma, Kasulu, Sumbawanga, Nkansi and Mpanda. The areas were selected according to peculiarities in economic activities, habitats and type of institutions and stakeholders. A fourth PRA exercise was done in Mwamgongo village, Kigoma District. The fifth and last socio-economic study was done in Sunuka Village in January, 2000. These studies document social institutions, ecological contexts and processes of socio-economic and political change in lakeshore communities and the wider catchment. The aim is to elucidate the local-level dynamics that induce different individuals and social groups to behave in the way they do in their pursuit of better livelihoods or profits.

### **0.2 Population dynamics**

Successive invasions by outsiders to the lakeshore communities have introduced socio-economic and cultural diversity. The coming of the Bembe from Goma marked the beginning of fishing and the cultivation of crops such as cassava, sorghum and groundnuts in the Kirando area. The coming of Arabs introduced Islamic culture and influenced the planting of tree crops such as coconuts, mangoes and oil palms. The arrival of the pastoralist Tutsi from Burundi during the middle of the 18<sup>th</sup> Century introduced cattle keeping in Rukwa Region; this ended at the end of the 19<sup>th</sup> Century with the spread of rinderpest, but in the past two decades there has been a westward expansion of the agro-pastoralist Sukuma people and their herds from Shinyanga and Tabora Regions in the drier parts of the Central Plateau. Although coastal communities like Kirando are cosmopolitan - their populations including such diverse ethnic groups as Arabs, Nyakyusa, and even the Zaramo from the Indian Ocean coast - the Fipa are in the majority forming more than 75 percent of the population concentrated in the South. The inland areas of the region are exclusively Fipa while in the North the Waha are the dominant group.

During the time of this survey the overall population was growing steadily. However there were remarkable variations between wards and villages. Areas like Kirando, Kalya, experience pressure on their resources due to rural-rural migration. Kirando and other Lake

Tanganyika coastal wards have been the focus of many immigrants from the Ufipa Plateau, the eastern parts of DR Congo and northern Zambia, who come in to fish, to grow rice, conduct business, or to get married. This is common in all the major coastal villages such as Buhingu, Kalya, Karema and Kabwe. These areas also experience out migration, usually males in search of work in the larger cities.

Ethnic and political conflict throughout the Great Lakes region over the past 35 years has affected population distribution and land use patterns in Kigoma Region as waves of refugees have come and gone. During the study period refugees from Congo and Burundi moved in, at times in many thousands people per month. The region has eight official camps harbouring almost 96,000 Congolese and 184,000 Burundian refugees. Environmental problems created by the influx of refugees have included rapid deforestation and resource depletion in and around the refugee camps. Forest resources have been used for shelter construction and fuelwood. Associated problems with refugee movement are demands on food and health impacts particularly the spread of Aids. Whilst it has been beyond the scope of this study to survey these it is of great importance to note that whilst some refugees are confined to refugee camps others integrate into the community and it is expected that this contributes to the spread of Aids.

Migration and movement can result in conflict between the original inhabitants of an area and the new immigrants, for example in Sunuka, or Kaliani, where many people have come from DRC to settle over the past thirty years. Lack of good governance has instigated disharmonious political alignments resulting in paralysis of Local Government elections such that there is no government at all in the village, or seemingly unresolvable conflicts with the neighbouring national park

### **0.3 Social issues and characteristics**

The education level of most of the inhabitants of the coastal villages is low. Many have some primary schooling but a considerable number have not finished the required seven years of study. This is because many have left school at an early age:- the boys employed in fishing while the girls are employed with harvesting and processing of paddy. Educational levels for women are lower than those of the men, and those of the youth are higher than those of their parents. Any environmental education programme instituted in the area should take consideration of this, as it has an implication on the choice of methodologies which can be applied. The situation among women is particularly dire. While they are the worst affected educationally they are the group which has shown most awareness of the problem of deforestation and the resulting soil erosion and are willing to take action to solve or ameliorate their effects.

The major health problems are bilharzia, Diarrhoea, Malaria, Cholera, Dysentery, Intestinal worms, Pneumonia, Anaemia, Wounds, Eye infections, Asthma, Aids and STDs, and Skin diseases. There are differences in the prevalence of these problems from place to place. Generally, the communities were aware of the necessity of good sanitation although the quality of the facilities differed greatly. Many people know about the need to boil drinking water, but often they did not do it for two reasons: a) the perceived shortage of fuelwood and b), people believe boiled water does not taste good. Most coastal villages have at least a dispensary within their confines. Ward headquarters usually have health centres that play a referral role for all the villages in the wards. However they generally have too few staff, too little medicine, and no operating facilities. Health education is regularly provided to mothers who attend the clinics. However, such knowledge rarely reaches men, as they do not



accompany their spouses to health centre so even where the respondent households had pit latrines people do not use them; they defecate in the lake. This was particularly problematic in the Moslem communities surveyed. Special efforts need to be made by health and environmental educators to reach all groups of people.

The majority of rural households in Tanzania are male headed. Women among the coastal communities conduct most reproductive labour, including cooking and cleaning as well as agricultural work, informal sector business and community development activities. In some villages the workload of women is increased by the out-migration of able-bodied males who leave for two months up to three years. Very few of these migrants remit anything home to help women provide for the family. In the Ha and Fipa tradition and the tradition of the Tabwa the man controls all resources, including land and income generated within a household. Even where a woman buys land from the proceeds of her businesses that land falls under the control of her husband. Although women contributed to the household income the main decision-maker in the household was almost always the man. Only a few households indicated that both partners shared in the decision-making process. Nevertheless, women awareness of this is high. Village governments have been ordered by the Prime Minister's Office to set aside 20 percent of leadership positions in the village government structure for women. However, women elected to sit in these governments are unable to play an effective representative role.

#### **0.4 Economic issues and characteristics**

Livelihoods include fishing, agriculture, mining, and trading in timber and other natural resources. Fishing is the main economic activity depended upon by almost all the people of the coastal villages - more than 80% of the households surveyed are involved in the activity as fishers, fish processors, or fish traders. Due to high costs of fuelwood most of the fish is sold unprocessed which reduces its market value. The dried fish is sold to wholesale business men and women who transport it to fish markets in Kigoma and thence to Dar es Salaam and/or Rumonge in Burundi. Such varied sources of demand complicate attempts at regulating the fishing activity at source. Fishing involves a cross section of the community. Those who own the fishing gears and those who are employees of gear owners. Terms of employment are negotiable and temporary. Until recently the main fishing gears used were beach seines, lift-nets catamarans (**kipe**), long lines (**kachinga** or **ndoano**), and gill-nets (**makila**). Currently, however, a majority of the fishermen use catamarans, followed by a sizeable sample still using beach seines, and long lines. Traditionally, beach seines were used to catch **dagaa** and other littoral fish. Only one trip was done per day, suggesting that the fishery in much of this zone shore is still rich enough to give the fisherman a day's income. The seines, however, are thought to destroy both fish habitats and breeding grounds. Since the fishermen normally use nets with small holes to maximise their catches, this type of fishing catches both mature and juvenile fish. The Fisheries Department banned its use but according to the informants in the SESS survey, the ban of the use of this fishing method had adverse effect on local economies. Jobs were lost without compensation. It was for this reason that a considerable percentage of the respondents indicated that they were still using the beach seines.

As much as the banning of beach seining could have reduced the fish catches and, therefore, the income earning potentials, recent political events in neighbouring Burundi and the DRC have also affected the economy of Tanzania's fishing villages. Both Burundi and the DRC had for a long while provided a lucrative market for their fish catches. With the on-going conflict in the two countries this market is no longer as secure. Moreover, the fact that much

fishing (the major means of the economy) is controlled by immigrant catamaran owners from Burundi and the DRC places these villages' economy in the hands of foreigners. Lift-net catamaran fishing is dominant. In some villages more than half of such catamarans belong to refugees from Burundi and the DRC. With on-going conflict in the these countries two things happened: a) the market in the two countries which was the motive force of the fishing villages' economies became less secure and, b) with it the immigrants' capital also left this zone's villages, leaving impoverished and dejected communities.

Despite the importance of fishing to the overall economy of the region, for much of the population along the lakeshore agriculture is the most important activity. Inland many people are primarily herders or farmers or both. In the main, even those whose primary activity is fishing do some subsistence farming. Agriculture, therefore, has the significant impact on the lake and lake shore environment, whilst on the surrounding catchment hills deforestation is considerable. The main livestock are cattle. Other animals include goats, sheep, ducks, chickens and the occasional pig. Horticultural activities are limited to a few low riparian strips and patches along the lake shore. They do not form a major contribution to the local trade or diet. The largest impacts of agriculture on the environment were seen to originate from:

- new shambas encroaching onto banks and the lake shore where the sandy soils are easily eroded and swept away during the rains;
- low intensity agricultural practices without sufficient fallow periods leading to soil exhaustion and constant expansion into new areas. This may also be linked to a lack of knowledge of alternatives;
- heavy cattle pressure in some areas;
- burning of vegetation to encourage fresh grass in the open grazing areas

Every household in the three zones cultivates. Beans, coffee, cotton, maize and to some extent bananas comprise the main cash crops. No inorganic fertilisers are used in the three zones. Fertilisation by animal manure is applied by less than a half of the households in the Highland Zone<sup>1</sup> and less than a quarter of the households in the Intermediate Zone. Non-use of inorganic fertilisers is universal due to their high prices (especially now when there are no government subsidies) and relative unavailability. More than three quarters of households in the three zones intercrop but decreasing land fertility is a problem. Productivity is low due to lack of management, land degradation and lack of extension services. Self-sufficiency in grains and other sources of carbohydrates is low with more than one third of the households below the food security line. The crops grown in the Miombo Zone are mainly for sale. The farmers send the crop directly to the market in Kasulu and Burundi. Sometimes it is sold on-farm to speculative middlemen. The ecological effects of the expansion of this farming has been extensive and often indiscriminate clearing of woodlands, resulting not only in the creation of open grasslands but also in wood fuel problems. People who extensify their farming into the Miombo woodlands, however, are aware of the disappearance of the virgin Miombo woodland.

Gold mining is done in Mpanda District on a small scale. It currently involves about 1,500 people. The main environmental threat is the use of mercury in gold binding. Other activities include running of shops, restaurants, vending of foodstuffs in the market and handcrafts. The

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<sup>1</sup> Keeping of livestock in this zone is, therefore, not only a means of accumulating wealth and insurance for bad times; it is a vital complement to crop production.. Very few households owned sheep in all zones. There is little livestock keeping in the coastal communities.

shops and restaurants are fairly small selling basic household items and foods, respectively. Another popular business is the brewing of local beer a business monopolised by women. Alcohol abuse is high in many villages.

The activity, which occupies a significant number of women in the coastal communities, is palm oil production. Women who specialise in this activity buy the palm fruits from local palm owners at a stipulated price and press them using a crude locally made machine. Another person almost always owns the machine and hence its use has to be paid for; usually in an agreed number of litres of the final product. Palm oil processing provides a possible diversification niche. With technological improvements to produce a higher quality product combined with trade promotion this could be a major economic activity although, once cottage industries are improved they tend to change ownership, with the poor owners losing to the rich who buy them out. Special safeguards for the poor women currently engaged in the activity should, therefore, be put in place.

Other sources of livelihoods include business, livestock keeping, and beer brewing; the general make up of which differ from one village to another. The problems, which face many of the people who have been getting loans, include delayed repayment and/or non-repayment. These problems have come about because a majority of the people who get these loans invest them in agriculture which is fraught with problems of poor technology and unpredictable weather. Those who invest in fishing claim that business is currently not certain. Catches have declined as buyers have increased and the market is unpredictable and competitive. Market fluctuations send many small business people out of business.

The main natural resource used for economic purposes, other than land and the lake, is wood from the local forests used for fuelwood and for building poles, timber and/or thatch grass. Tree planting is seen by many of the respondents as the solution to the ensuing shortage of firewood and building material. However, few people utilise the tree seedlings raised by NGOs.

### **0.5 Institutional appraisal**

Institutions studies range from the family to the governments well as a variety of formal and informal institutions, including local community groups, NGOs, and various other groupings of people. There has been some continuity in traditional institutions and beliefs that govern the utilisation of the environment but the institutions have passed through several phases of development. Officially, the traditional institutions that had governed local resource use were superseded by state-controlled institutions. The state also appropriated the legal ownership of natural resources such as land and water. In reality, however, the management and use of these resources has in many places continued being mediated by traditional tenure regimes and other local resource use arrangements. Government institutions lack basic resources. Recent manpower retrenchments have reduced the capacity of some departments. Departments such as Natural Resources and Agriculture and Livestock who have to monitor and control natural resource use and help develop the agricultural system through extension services have had their field staff reduced by 60%. Moreover, they have no transport to reach their areas of operation. Departments such as Health and Water now depend on transport facilities provided by donor agencies and/or international NGOs working in the districts. Nevertheless, some departments cannot even maintain such cars due to lack of recurrent funds.

All the villages visited in the catchment indicated a close adherence to the formal organisational structure with 25-member VCs. There are, however, minor divergences as regards the type and number of sub-committees. Such divergences are of particular interest to the LTBP, as they demonstrate that villages are able to create new institutions under the umbrella of the VC to cater for special local organisational requirements such as environmental management and/or conservation. Nevertheless, popular participation in the socio-political life seems to be generally low in many villages. Furthermore, the problems of lack of experience and confidence necessary to play an effective representative role have been a major setback to people's representation. This situation is particularly serious for women representation. Women could not articulate needs. Formal institutions at the village level are more instruments for the enforcing of regulations and orders from the higher administrative levels than instruments of grassroots democratic representation. Central Government determines village life through a variety of operations and legal acts. It has determined, for example, where villages and individual homesteads should be located; who should live in a particular village and the nature of social reproductive activities that could be conducted. In this respect it has even regulated the types and amount of crops that could be grown; the acreages of each crop and the agricultural methods to be used. Such patronisation has deskilled the people and undermined the capacity and initiative to play a meaningful role in local politics.

There is a proliferation of NGOs which include international institutions<sup>2</sup> that recently have extended their activities to include local development issues as well as servicing the refugees. Africare Tanzania is extending activities into the financing and co-ordination of the establishment of small scale income generating activities/enterprises. TACARE offers educational grants to girls for secondary education and also supports a Savings and Credit package for women group. Some institutions offer loans and various aid packages - the Rukwa Association of Non-Governmental Organisations (RANGO) which offers small loans as seed money to various local economic groups and the International Fund for Agricultural Development (IFAD) who have helped the local Department of Agriculture with working tools (including the much needed transport facilities) and technical know-how. Other institutions include GTZ (whose involvement is concentrated in issues of food and nutrition), and the World Food Programme which gives out small loans to help simple animal husbandry in some areas. There is also a revolving Women's Development Fund provided for by the Government of Tanzania.

Most of the local NGOs, however, conceptualise environmental conservation as equivalent to **re/afforestation**. Other conservation measures are not in vogue possibly due to the dominance of foresters in these institutions. Management is a major problem in most of these NGOs. Many of them are run as one man's shows, while others are groups of people with vested interests and ulterior motives. Shortage of funds, lack of knowledgeable and effective leadership are other major problems besetting these organisations.<sup>3</sup> Except for the DWT and

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<sup>2</sup> Such as CARE International, Africare Tanzania, and Christian Outreach that serve Congolese and Burundian refugees, operate as UNHCR implementing partners.

<sup>3</sup> Local NGOs include the Rural Services Programme of Tanzania (RUSERP) and the Diocese of Western Tanzania (DWT). RUSERP is currently operating as an implementing partner of the UNHCR in education in refugee camps, distribution of food, and training of trainers in improved stoves, afforestation, environmental education, small scale entrepreneurship and general community development techniques. The DWT offers extension services to the villages with emphasis on afforestation, development of energy saving stoves, biogas, irrigation and oxenisation of agriculture. Another local NGO that is Exploit and Help Nature (EHENA) and promote the quality of education, health services and environmental integrity in Kigoma Region. There is also a

other nascent NGOs all of the international NGOs existing in the area came into Kigoma Region in response to the refugee crisis in the region. Bureaucratic inertia and mismanagement in individual member organisations has led to acrimonious relationships between RANGO and some of its member organisations. Some new NGOs, e.g. the MPECO of Mpanda, have as a result been wary of compliance.

## 0.6 Conclusion

Although the general level of environmental understanding seems to be reasonable, it varies substantially between individuals and communities. The commitment to effect any change is, however, far less for a number of reasons: the perception gap, the politics associated with conservation, gender inequity and the educational levels of the target communities. Officials and local land users often have different perceptions about environmental problems. One study, for example, established that despite extensive gullying villagers did not perceive it as a major problem. Many of them had grown up seeing degradation as a natural process. Many fishermen believe that the fish are disappearing because of the improvement of fishing techniques. It was argued that lack of unanimity among the respondents probably suggested the existence of fluctuations in the abundance of fish through the years or that there has been no systematically witnessed degradation of the littoral fish stock. As long as one specie, **Dagaa** is abundant fishermen may not pay attention to changes in the abundance of other fish species. Local awareness raising on this issue seems important once it has been established that there is indeed a decline in the abundance of fish within and between species. No research has been done on the values people put on different fish species and fisheries with the socio-cultural and economic values of different fish species not properly documented. **Enhancing the fishers' ability to correctly interpret changes according to the new circumstances and improving local knowledge by intermarrying it with scientific knowledge is the challenge which faces researchers and development workers in the Lake Tanganyika basin.**

Because markets for fish are so diverse and widespread, the economies of villages heavily dependant on fishing are sold are vulnerable to the effects circumstances beyond their control. For example, fishing villages in the northern part of the coast which traditionally exported fish to Burundi and Congo have seen their economies decline as those markets have become difficult to access by small or medium scale traders as a result of conflicts there. Similarly, a significant portion of the capital and investment in fishing in Tanzanian waters is not from nationals, and fluctuates in response to the situation in other lakeshore countries..

Environmental problems related to fishing activities include deforestation due to fish processing. The problem is growing and needs immediate attention. However, the type of plant species most used in fish processing, their spread in the ecosystem, their biodiversity value and their alternative uses are yet to be properly documented. Many farmers say proposed change would increase work load. In the case of deforestation, trees whilst low in number in the main valleys are not seen as being particularly important in the area. On the other hand, **whilst soil erosion is recognised it does not seem to have reached the point where people feel the need to do something about it; partly due to the fact that people can still get access to other land if they need it. Many rural inhabitants in Tanzania are suspicious of the intentions of outsiders who come in with offers of help or new ways of**

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women's association called Uvinza Women Association that deals environmental conservation in Uvinza through the promotion of the use of improved stoves and afforestation.

**doing things in their communities. Bad experiences with previous state interventions are often the reason for this attitude.**

Forest Reserves are facing considerable pressure from deforestation due to timber production, fuelwood collection, and agricultural expansion for flue-cured tobacco. Poaching also occurs in the Game Reserves. FRs now managed by the districts were established by colonial administration for sustainable resources utilisation. However, the latter day objective of generating revenue for districts has undermined the aim of sustainability. This is becoming more evident under the Local Government Reform process. In general the District Councils which are self-funding agencies lack the capacity for managing and supervising extraction from local authority FRs. Shortage of manpower, lack of funds, lack of transport and other equipment exacerbate the problem of natural resource use regulation and control. As a result the majority of such reserves are degraded and subject to encroachment by the local communities and commercial extractors of timber, charcoal and wildlife.

Many fishermen considered their fishing gears too old and technologically out-dated to maximise profits. The trend in the near future, assuming that the problems of piracy and insecurity in high waters and neighbouring countries stabilise may be that traditional catamarans will be abandoned for the bigger more expensive catamarans. If the government does not intervene to regulate fishing in Lake Tanganyika and national banks and lending institutions in Rukwa and Kigoma do not support local investment in fishing the new fishing fleets may belong to neighbouring countries' investors.

## 1 INTRODUCTION

### 1.1 Background

Lake Tanganyika is the largest of the African rift lakes and is also one of the most unusual biotic resources on earth. As yet the lake receives little legally mandated environmental protection. The most serious immediate problems facing the lake ecosystem result, according to some authors, from overpopulation within the lake basin and impacts associated with overpopulation. Excessive suspended sediment input into the lake (purportedly due to basin deforestation), overfishing, and pollution are said to be the primary manifestations of this problem (Patterson & Makin, 1998:63). Sedimentation and overfishing are said to have led to wide spread modification of the lake's ecosystem through local extinctions and reduced complexity of species interactions within the lake (Cohen, 1991).

Conservation of biodiversity is complex in that it involves walking a tight rope while balancing between human interests and the interests of nature. The balancing act is further compounded by the fact that human interests are never homogeneous. They often manifest themselves in conflicting self-interests resulting in interest groups locked in mortal contest for control of nature and its resources (Vane-Wright, 1996). For the diversionists environmental disruption is taking such alarming proportions that it should become a major and constant concern for all citizens. People are being called upon to organise themselves in order to protect the ecosystem. The action they are expected to take is, however, purely preservationist in nature. No links are established between environmental disruption and the working of the socio-political system (Sachs, 1972:126).

For the neo-Malthusian the resources of the spaceship Earth are in short supply, to an extent that the earth may prove incapable of supporting on a sustainable basis a population as large as the present one (Cole, 1970:14). And since not all countries can industrialise some have suggested that people in underdeveloped countries should be permitted to starve to death in order to concentrate resources on the better cases of the developed world (Paddock & Paddock, 1967). The Ehrlichs, however, advocated developed countries to de-develop while the underdeveloped ones contented themselves with semi-development. In the authors own words:

*As examples of semi-development, Kenya and Tanzania might be semi-developed as combination agrarian-recreation areas. They.... can supply the world with a priceless asset: a window on the past when vast herds of non human animals roamed the face of the Earth. They could also provide one of the many living stockpiles of organic diversity, stockpiles which may prove of immense value as mankind attempts to replenish the deteriorated ecosystems of the planet. These and similar areas could serve as rest-and-rehabilitation centres for people from the more frantic industrialised parts of the planet. They would also serve as guarantors of cultural diversity, as areas specifically reserved to permit peoples to maintain their traditional ways of life...(Ehrlich & Ehrlich, 1970:313).*

The paternalism is reminiscent of the colonial administrators of sub-Saharan Africa in the 1920s and 30s who frequently associated accelerating soil erosion, deforestation and rangeland deterioration with peasant ignorance and short-sightedness. Accordingly it was attempted to regulate land use with conservation norms developed in Western Europe and the United States under very different social and ecological conditions. Often such colonial conservation efforts not only ignored the needs of the inhabitants and communities living within or adjacent to game and forest reserves, but also in many cases deprived them of

means of subsistence through evictions or restrictions on their access to rangelands, forests, and fisheries. In fact conservation programs became indistinguishable from the destructive aspects of the dominant patterns of development (Ghai, 1994:7).

This approach to environmental conservation continues to be applied today (Barraclough, 1995:48-49). The case of Lake Tanganyika is interesting in that the fishery is an open access resource as opposed to a common resource, like land. Its management demands that inter-community institutions and best-practices are identified and put in place before management programs are initiated. So far, however, such programs have primarily involved banning specific fishing gears or methods considered to be destructive. Such legislation has tended to be applied nationally with little regard to local environmental or socio-economic conditions, and with little or no consultation with those affected. This has resulted in poor compliance, as fishermen feel they have few or no alternatives open to them, and has had limited success due to lack of resources on the part of those mandated to enforce the law, a particular problem in such a large and remote lake as Tanganyika. Despite this lack of success however, this type of management action remains in favour with many central government officials with little knowledge of the lake.

Respect for local conditions is crucial as in addition to varying environmental conditions, different localities have different institutions that regulate access to resources and the division of labour and production. Local populations are stratified in a variety of occupational and status roles. Lineages, ethnic or religious identification, class, age, and gender, as well as linkages with markets and political authorities outside local communities all influence which social groups are most relevant to consider in a given locality when trying to understand livelihood issues and their relations with natural resource management. Moreover, many rural societies in developing countries are undergoing disruptions as they become increasingly incorporated into regional, national, and international markets, power structures, and conflicts. In attempting to understand better the processes and relationships contributing to natural resource degradation and the social implications of this, these factors have to be considered.

## **1.2 The Socio-Economic Special Study**

A series of Special Studies have been conducted along the lakeshore and in the wider catchment. These studies have included biodiversity, sedimentation, pollution, fishing practices, and socio-economics.

The Socio-Economic Special Study (SESS) aims to identify ways to promote:

- participation in fisheries and wider natural resource management by local communities;
- improved, more sustainable fisheries and resource utilisation practices;
- alternative livelihood and income earning opportunities outside of fisheries, especially where lake biodiversity is threatened; and
- environmental education work, to facilitate the above, and to promote general awareness of the importance of the lake resource, especially amongst local people and local government.

Since January, 1997 The SESS has undertaken in-depth participatory action research at selected sites to investigate the social and economic aspects of life with the objectives of improving understanding of:



- livelihood strategies of local communities, as a basis for informed intervention by interested partners in development;
- patterns of natural resource utilisation, and the threats to natural resources and biodiversity of the lake;
- the socio-economic make-up of lakeshore communities and the key stakeholder groups;
- institutional mechanisms whereby improved resource management and local development initiatives might be introduced.

From these investigations specific proposals for action can be developed for implementation by appropriate local, national, or international institutions and organisations. Data collected from the studies will form a baseline against which their impacts can be measured.

The first investigation which involved a multidisciplinary approach was carried out at Mtanga village in the vicinity of Gombe Stream National Park (GSNP). Results of that work are reported in Lwoga, 1997. A second comprehensive PRA was undertaken in August 1997 in four villages in Kirando Ward, Nkansi District, Rukwa Region; results are reported in Mung'ong'o (Ed.) (1997a). A third PRA was undertaken in December 1997 in Buhingu Ward, Kigoma Rural District, Kigoma Region, in the vicinity of the Mahale Mountains National Park, and a was reported in Mung'ong'o (Ed.) (1997b).

In February and July 1998 two surveys were conducted in selected areas in the wider catchment in Kigoma Rural, Kasulu, Sumbawanga Urban, Sumbawanga Rural, Nkansi, and Mpanda Districts to collect data on the socio-economy and institutional set-up of the Tanzanian lake basin (Mung'ong'o, 1998ab). The areas were selected according to peculiarities in economic activities, type of institutions and stakeholders, and habitats.

In October 1999 a fourth village level socio-economic study was undertaken in Mwamgongo village, Kigoma Rural District, and was reported in Mung'ong'o (1999). The final socio-economic study in Tanzanian was undertaken in Sunuka village, Kigoma Rural District, in January, 2000, and is reported in Mung'ong'o (2000).

This paper synthesises the results of these studies. It documents ecological contexts, social institutions, and processes of socio-economic and political change in communities vulnerable to natural resource degradation. The aim is to elucidate the local-level dynamics that induce different individuals and social groups to behave in the way they do in their pursuit of better livelihoods or profits.

The paper is divided into six sections. Following this introductory section, Section 2 outlines the data collection techniques used. Section 3 describes the study area and outlines its physical characteristics. Section 4 describes the major socio-economic characteristics of the area. Section 5 appraises the institutional framework of the basin, including a discussion of its potential for sustainable natural resource management and/or environmental conservation. Finally, Section 6 concludes the synthesis and identifies knowledge gaps and areas for future intervention and/or research.

## 2.0 METHODOLOGY

### 2.1 PRA tools and group meetings

Data were collected using mapping, transect walks, timelines, seasonal calendars, daily timetables, wealth ranking, and informal semi-structured household interviews. Community and themed focus group meetings to do mapping, timelines, seasonal calendars, and wealth ranking, and to discuss gender issues were typically held on the first day of fieldwork. Key informants, such as teachers at local schools, village Sheikhs and/or priests, local Health Officers and Fisheries Officers, and members of the Village Council were also informally interviewed.

### 2.2 Household data

In order to improve understanding of household characteristics, dynamics, and survival strategies one of the first data collection tools used was wealth and social group definition. Informed local people were asked to define what constitutes "wealth" in the village, and then, on the basis of this definition, to identify socio-economic groups. Steps followed included:

- Listing of assets that are perceived as "wealth" in the village. Lists typically included fishing gear and shops (*duka*), with other assets varying by community.
- Determining the importance of each of these as criteria for assessing wealth or social status. In some villages, items with marginal value in terms of income generation, such as houses, or goats and sheep, were dropped, while in others they were retained as indicators of status.
- Defining wealth groups depending on the types and quantities of assets owned by households

Generally, a household with more than one engine-powered catamaran, a *duka* with an operating capital of at least 500,000 TSh (more in some places), or, in some areas, a significant area planted with oil palms (*migazi*), qualified as well-off. A household with a combination of these assets, e.g., a catamaran and a *duka*, etc, was considered more well-off than one with only one of the three assets, as the former's income generating capacity was diversified and constant, while the latter was seasonal.

A very poor household was, on the other hand, defined as one with none of these assets, insecure food supply; poor shelter and clothing, and little hope in life. Begging is a major survival strategy, and the elderly and unemployed are included in this group.

In between these extremes villagers tended to identify two other middle groups. These were the not-so-wealthy (*Wenye uwezo kiasi*) and the not-so-poor (*Wasio na uwezo kiasi*). The not-so-wealthy typically have paddle catamarans, some cultivated land, some *duka* with less operating capital (e.g., less than 200,000 TSh), or were rice or fish traders operating with a capital of up to 200,000 TSh, and employed others to work for them. The not-so-poor depended on *kibarua* on other people's catamarans or *shambas*, cultivated a small area for subsistence, but did not have a secure food supply throughout the year.

A semi-structured checklist of questions was then used to collect information on household size and composition, educational levels, sources of livelihoods, expenditure priorities, labour use and availability, access to financial resources, health and sanitation, access to natural resources, and gender relations and the division of labour from a systematically selected sample of households.

### **2.3 Fishing practices**

Particularly in the early studies, the SESS team worked closely with the FPSS (for more details see FPSS reports). Techniques used in the study of fishing practices included sampling of fish catches to evaluate catch composition and length frequencies, and interviews with fishermen and other stakeholders to gauge technical aspects of the fishery, its catches, history, and trends. Data were triangulated by observation and reference to earlier studies elsewhere. The team observed the catches of the various gears to identify the ones likely to be destructive. Gillnet and line catches, consisting mostly of 20cm or longer specimen, were observed but not sampled, as the team concentrated its sampling on length frequency analysis of the beach seine catches.

### **3.0 THE STUDY AREA**

#### **3.1 Geographical context**

The largest part of the Lake Tanganyika basin is in Tanzania, and can be divided into two zones, namely the Malagarasi catchment and the north-eastern lakeshore, and the Ufipa Plateau and the southern lakeshore.

##### ***3.1.1 The Malagarasi catchment and the north-eastern lakeshore***

The Malagarasi catchment is the largest of the catchments of the lake, and drains an area of 130,000 km<sup>2</sup> which stretches from the Burundi-Tanzania border through the extensive Malagarasi-Moyowosi wetlands before crossing the Misito Escarpment in a series of falls and rapids. The principle tributaries are the Moyowosi and Igombe which flow through the seasonal Lake Nyamagoma. Others include the Ugalla and Walla, which also create seasonal lakes before joining the Malagarasi, and the Luiche. The confluence of the Ruchugi is at the Uvinza Salt Mines.

Administratively the catchment encompasses the districts of Kasulu and Kigoma Rural in Kigoma Region. Kasulu District is situated north-east of the lake while Kigoma Rural forms the northern part of its eastern shore. The two districts are characterised by three distinctive eco-climatic zones, the Highland Zone between 1500 and 1750m, the Intermediate Zone between 1200 and 1500m, and the *Miombo* (lowland) Zone between 1000 and 1200m, characterised by a gently sloping landscape. While Kasulu District straddles all the three zones, Kigoma Rural lies mainly within the *Miombo* Zone. The Malagarasi forms the boundary of Kasulu on the north-west, north, north-east and east.

The rocks of the Highlands are mainly of diabase type, with lateritic soils consisting of dark red clay loams, with the exception of the extreme south-west where sandstones predominate, and the south where there are limestone and crystalline rocks. The same diabase red clays are found in the *Miombo* Zone, but exposed concretions of iron-hydroxide make agriculture impossible in many areas (Yanda & Mung'ong'o, 1997).

The physiography of much of the southern part of Kigoma District is a continuation of the Ufipa Plateau. It ranges from complexes of gently undulating plains and plateaux with steep hills, footslopes and valleys developed on schists, acid volcanics, gneisses and sandstones between 1,200 and 1,700m, to lower lakeshore alluvial complexes characterised by flat plains covered with riverine alluvia regularly flooded with homogeneous sediment. The soils of the lakeshore belong mainly to the Lake Tanganyika lacustrine terraces and range from loams on high, well-drained terraces and floodplain benches, to clays on low floodplain benches. In the south, the Mahale Mountains rise steeply to 2,462m at the Nkungwe summit, and the the Kabogo Range also dominates

The climate is humid with mean annual rainfall ranging between 1,000mm on the plains and 1,200mm in the Mahale Mountains. Rainfall is unimodal, with the wet season lasting from November to early March, and a prolonged dry season. Precipitation is reliable allowing a wide range of crops to be grown, with some double planting of short season crops such as beans. Lowland areas are warm for most of the year, except around June when the nights can be cool. The Mahale Mountains experience comparatively high temperatures during the day and cool temperatures during the night, particularly during the dry period from June to early September. It is during this period that high winds and dangerous storms are experienced (BRALUP, 1981:4-6).

The Malagarasi catchment experiences a wet season between November and April, with mean annual rainfall ranging from 1200 to 1600mm in the Highlands and 900 to 1200mm in the lowlands.

The catchment has two distinct vegetation associations. Rich grasslands dominate the Highlands, while the lowlands are mostly comprised of woodland characterised as *miombo*, with a high proportion of pyrophitic species of the genera *Brachystegia*, *Berlinea*, *Terminalia*, *Combretum*, *Pterocarpus*, *Psorospermus* and *Acacia*.

### **3.1.2 The Ufipa Plateau and the southern lakeshore**

The geology of much of the Ufipa Plateau belongs to the Bukoban System and is characterised by the presence along the lakeshore of alluvium of the Quaternary Period (IRA/Clark University, 1984). In the north and the north-east the System is characterised by the Mtakuja Conglomerates comprising conglomerates, sandstones and siltstones. In the south it is characterised by the Kipili Volcanics with a predominance of Andesite-dacite porphyrites, rhyolites and tuffs. Both the Mtakuja Conglomerates and the Kipili Volcanics are believed to have been formed during the Proterozoic Period. The soils of the Lake Tanganyika lacustrine terraces range from loams on the high, well-drained terraces and floodplains, to clays on the low floodplains.

The climate of the Ufipa Plateau is sub-humid with mean annual rainfall ranging between 900 and 1120mm, although it is very variable. Along the lakeshore the climate is semi-arid with the mean annual rainfall ranging between 800 and 900mm. The Kirando rainfall station, for example, receives a mean annual rainfall of 843mm unevenly distributed in 81 days. However, the lowest recorded value at the station is 490mm. The mean temperature is 27°C.

The vegetation of the plateau is grassland, with thick *miombo* woodland in the north with a high proportion of pyrophitic species of the genera *Brachystegia*, *Berlinea*, *Terminalia*, *Combretum*, *Pterocarpus*, *Psorospermus* and *Acacia*.

## **3.2 The socio-economic environment**

### **3.2.1 Ethnic composition, villagisation and movement**

The dominant ethnic group in the Malagarasi Catchment and northern lakeshore is the Waha. Traditionally, the Waha people are of two types: the agropastoralists of the highland areas of Heru Juu, and the agriculturists who live in the tsetse-infested *miombo* woodland along the Malagarasi and other rivers. For centuries the agropastoralists confined themselves to Heru Juu where they practised a sedentary form of agropastoralism with huge herds of cattle, as movement to the plains was hampered by the threat of tsetse. However, the rinderpest epidemic of the 1860s wiped out much of the livestock. This reduction in cattle numbers may have contributed to the extension of the *miombo* woodland and the tsetse it harbours to large areas of Kasulu District.

It was not until after independence (1966-1970) that people started moving into the Intermediate and Miombo Zones, primarily for political reasons. Mung'ong'o (1995:80-85) discusses how, according to the Arusha Declaration of 1967, development in rural areas was to be achieved through the establishment of *ujamaa* villages. In such villages crop production and general social reproduction were to be undertaken on a co-operative basis. Meanwhile, new forms of agricultural and socio-political organisation were established. A gradual transformation of the existing peasant systems in terms of scale of operation and production techniques was also envisioned. At the socio-political level, *ujamaa* socialism and self-

reliance became the ideological basis for the mobilisation of the enthusiasm and initiative of peasant social groups.

These circumstances led to a significant migration of agropastoralists from Heru Juu to lowland areas. Much of the initial movement was from the Highland Zone to Intermediate Zone villages such as Ruhita. At this time, this zone represented the frontier of the highland farming system. Very few people moved into the Miombo Zone, not only because such movement had previously been prohibited by the colonial administration, but also for fear of the tsetse infested wilderness<sup>4</sup>.

The Villigisation Program of 1972-1974 code-named *Operation Kigoma* had a major impact on population distribution and land use patterns in both Kasulu and Kigoma Rural Districts, and the majority of people in the lowland zones today settled there during this period. The programme aimed at restructuring not only the rural economy, but also its socio-cultural institutions so as to produce a relatively undifferentiated peasantry suited to the state's project of national capital formation (Mung'ong'o, 1995). However, Yanda and Mung'ong'o (1997) observed that during the 1980s and 1990s there was a slowing in permanent out-migration from villages in the Highland Zone to the expansion villages, especially by older people. Agricultural expansion appears to be the primary means of solving the problem of dwindling land resources in the core villages in the Highland Zone in the face of increased demands for foodstuffs locally and in the external market of neighbouring Burundi. Yanda and Mung'ong'o (1997) further observed that despite enormous out-migration, migrants continue to be integrated into the core areas through enduring socio-cultural relationships, such as the acquisition of wives, and the performance of social obligations and rituals to ancestors and nature<sup>5</sup>. In this way core areas in the Highland Zone have not only provided a base for cultural continuity and social cohesion, but have also provided a homeland for the Waha who venture into the dynamic and dangerous frontier zones to grow crops for sale or to seek migrant wage labour in Urambo and beyond. More recently political events in neighbouring Burundi and Congo have influenced the ethnic composition of lakeshore villages, which have received numerous refugees and migrant fishermen.

The Ufipa Plateau and the southern lakeshore comprise the districts of Nkasi, Mpanda and Sumbawanga in Rukwa Region. Coastal areas like Kirando, Kipili, Buhingu, etc., are some of the oldest settled areas in region. Bembe fishermen from the eastern parts the Congo first settled these areas, and close cultural and linguistic affinities between these communities and Goma in eastern Congo are still evident today. The first non-African influences reached the area in the middle of the 19th Century when Arab slave and ivory traders established a provisioning post at Kirando. German Catholic missionaries of the Order of the White Fathers based themselves at Karema and in 1888 established a mission at Kipili. However, German occupation of the area probably did not really take effect until after 1890 when a boma was built at Kipili (Mung'ong'o (Ed.), 1997).

The successive invasions by outsiders introduced new socio-economic and cultural strands to lakeshore communities. For example, the coming of the Bembe from Goma marked the beginning of fishing and the cultivation of such crops as cassava, sorghum and groundnuts.

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<sup>4</sup> Focused interviews at Ruhita, September, 1996.

<sup>5</sup> See also the importance of rituals to the Wateko as described by Wagner, M. (1996). Environment, community and history: "Nature in the mind" in the nineteenth and early twentieth century, Buha, Tanzania. Chapter 7. In: Maddox, G., J. Giblin & I.N. Kimambo (Eds.). *Custodians of the land: ecology and culture in the history of Tanzania*. London, etc: James Currey, pp. 175-199.

The coming of the Arabs introduced Islamic culture and influenced the planting of permanent tree crops such as coconuts, mangoes, and oil palms, which are characteristic of many lakeshore villages to this day. The coming of the pastoralist Tutsi from Burundi during the middle of the 18<sup>th</sup> Century introduced cattle keeping in Rukwa Region in general. However, the rinderpest epidemics of the late 19<sup>th</sup> Century decimated herds and reduced the influence of cattle in the economy of the area (URT/Kingdom of Norway, 1982:2-5). In the past two decades there has been a larger westward expansion of the agropastoralist Sukuma people and their herds from Shinyanga and Tabora Regions in the drier parts of the Central Plateau. This latest invasion has affected the area negatively through overgrazing and deforestation, but has also had positive effects through the introduction of the use of manure and ox drawn ploughs.

Although southern lakeshore communities such as Kirando are cosmopolitan - their populations including such diverse ethnic groups as Arabs, Nyakyusa, and even the Zaramo from the Indian Ocean coast - the Fipa are in the majority in all villages, typically forming more than 75 percent of the population. The inland areas are exclusively Fipa.

### **3.2.2 Structural distribution of wealth**

Lakeshore communities can generally be distributed in four wealth groups: the well-off; the relatively well-off; the relatively poor; and the poorest of the poor.

#### **3.2.2.1 The well-off**

Generally, this group is composed of households with more than one engine-powered catamaran, a *duka* with an operating capital of at least 500,000 TSh (more in some places), or, in some areas, a significant area planted with oil palms (*migazi*). A household with a combination of these assets, e.g., a catamaran and a *duka*, etc, was considered more well-off than one with only one of the three assets, as the former's income generating capacity was diversified and constant, while the latter was seasonal.

Another important feature that further distinguishes this group from the others is the size of the family labour force these households command. It was observed, for example, that the head of one of the most well-off households in Mwamgongo has four wives, more than thirty children, and several other siblings and relatives living in his compound. As fishing and farming, the main systems of production, are highly labour intensive, and the distribution of the means of production, particularly in fishing, is highly skewed, such a pattern of labour distribution inevitably puts this group in a very advantageous socio-economic position. Furthermore, once a household has attained a certain level of prosperity, it is able to draw in and support more extended family members, and thus expand further.

The economic position of a social group in society determines to a certain extent the amount of political power which can be accessed by individuals of that social group; that economic power is a prerequisite for a particular social group's ascendance to political power (Mung'ong'o, 1995:46-47). Data from Mwamgongo suggest that there is a positive relationship between economic power and political power. For example, during the period of the study the tenure of the village government expired, and its members resigned to allow for elections. It was observed that the out-going chairman and other powerful members of his government (all of whom had applied for re-election) all belonged to the well-off and/or relatively well-off groups.

This group is generally by far the smallest in the village. For example, in Mwamgongo it comprised only 1% households, and in Sunuka, although the group was defined, villagers did not think any household could actually be included in it. Data suggest the existence of both multidirectional and centripetal mobility of households between socio-economic groups. A multidirectional mobility involves opposing movements of individual households between the socio-economic groups which cancel each other out, i.e., a simultaneous rise of poorer households and a fall in the fortunes of some of the wealthier ones due to changes in state policies, fluctuations of weather, and changing terms of trade between rural and urban centres, or between nations. At the same time there is also a centripetal movement of households in relation to the median wealth in society. In the case of Mwamgongo the abolition of chiefship in 1962, the Villagisation Programme of the 1970s, the banning of beach seining, and the changing political situations in Burundi and Congo during the 1990s may have facilitated the fall of some of the wealthier households and generally pulled down the economic fortunes of the village.

One reason for the extremely small size of this group is that some households in this wealth group chose to reinvest outside the natural resources sector (fishing and farming) in businesses such as shops or garages, or in real estate, and are thus able to move out of their villages to Kigoma and beyond. In Mwamgongo, a considerable number of well-off households are said to have done this, and moved to inland urban centres such as Kahama, Shinyanga and even Dar es Salaam.

#### **3.2.2.2 The relatively well-off**

Generally, the relatively well-off (*Wenye uwezo kiasi*) typically have paddle catamarans, some cultivated land, some *duka* with less operating capital (e.g., less than 200,000 TSh), or are rice or fish traders operating with a capital of up to 200,000 TSh, and employ others to work for them. This group is bigger than the well-off group, but still only comprises 5-30% of households. This group typically is a disparate entity embracing a broad spectrum of households from those who are almost in the well-off group to those who are in the relatively poor group. A general feature of this group, however, is that households are the next largest in size, with those at the upper end of the spectrum generally larger than average, and those at the lower end smaller.

#### **3.2.2.3 The relatively poor**

The relatively poor (*Wasio na uwezo kiasi*) are typically the largest group, comprising 45 – 60% of households. They depend on *kibarua* on other people's catamarans or *shambas*, cultivate a small area for subsistence, but do not have a secure food supply throughout the year.

#### **3.2.2.4 The poorest of the poor**

This group forms the lowest social stratum and varies in size from 5 – 30% of households, depending on how the group was defined. They have none of the assets listed under the previous three groups, and are insecure in food supply, have poor shelter and clothing, and little hope in life. Households headed by women, or unemployed youths, or those made up of elderly people only are included in this group; begging is a major survival strategy.

### **3.3 Demographic trends and household characteristics**

#### **3.3.1 Demographic trends**

Table 1 shows census data from four districts in Kigoma and Rukwa Regions.



**Table 1: Human population in four districts in Kigoma and Rukwa Regions, 1967 - 88**

	1967	1978	1988
Kigoma Rural	108,804	194,520	273,390
Kigoma Urban	21,369	58,788	84,647
Kasulu	207,175	255,651	320,518
Nkansi*	66,950	52,838	110,175

\* Until 1978 Nkansi District was a part of Sumbawanga District. The figures for 1967 and 1978, therefore, represent only the coastal wards of Karema, Chala, Kala, Kirando, Namanyere and Kabwe, now in Nkansi District.

The annual average growth rates for the periods between 1967-78 and 1978-88 for Kigoma and Rukwa Regions were 2.9 and 2.8, and 4.5 and 4.3%, respectively. Fertility levels, and therefore potentials for growth, seem to be much higher in Rukwa Region than in other regions of Tanzania, while those in Kigoma Region are within the national averages (3.2 and 2.8%, respectively). Except for Kigoma town where growth rates can be expected to increase due to rural-urban migration, growth rates for much of the lakeshore are not increasing, although they remain positive.

The average household size in Kigoma and Rukwa Regions in the census years of 1967, 1978, and 1988 was 4.5, 5.5 and 5.8, and 4.7, 5.1, and 5.3, respectively. These deviate positively from the national averages of 4.4, 4.9 and 5.2, respectively.

These regional figures mask considerable variation between wards and villages. Some strategic areas such as Kirando, Kalya, etc. are suffering from increased pressures as a result of rural-rural migration as they have been the focus of immigrants from the Ufipa Plateau, from eastern Congo, and from northern Zambia who come to fish, to grow rice, to conduct business, or to get married. The influx of the Sukuma agropastoralists and their herds in Kirando is a typical case in point (Mung'ong'o (ed.), 1997). However, political events in the region are also important, for example the population of Buhingu Ward declined by more than half (58%) between 1988 and 1997 primarily as a result of the repatriation of Congolese resident there until the fall of the Mobutu government.

### 3.3.1.1 Fertility levels

In general fertility levels seem to have decreased somewhat in recent times. Currently a woman conceives between six and ten pregnancies in her lifetime, down from eight to 15 a decade ago. However, typically only six of these babies live to maturity. However, age of first pregnancy seems also to have decreased considerably, with girls as young as 12 reported to have given birth, although it was not clear how common this is.

### 3.3.1.2 The impact of refugees

Population distribution and land use patterns in Kigoma Region have been impacted by the presence of refugees from neighbouring countries in the region since independence. In recent months people from Burundi and Congo have been moving in at up to 5,000 per month. Currently, the region has eight camps harbouring approximately 280,000 Burundian and Congolese refugees. 178,000 of these are in four camps in the Malagarasi Catchment: Nyarugusu, Mtabila I and II, and Muyowosi in Kasulu District, and Lugufu in Kigoma District (Nsokolo, 1999:3). Environmental problems associated with the presence of the camps include rapid deforestation and resource depletion for use in shelter construction and as fuelwood. Mtabila and Moyowosi camps are located in degraded scrub woodland and grassland with low standing biomass, and suffer from soil erosion, siltation and water pollution as a result of poor land and water management. Impact on tree cover is described as

severe, with a two year radius of deforestation of 11.2km, and there are resource use conflicts between refugees and local people. Nyarugusu and Lugufu camps are located in relatively undisturbed *miombo* woodland but suffer from siltation, which causes flooding at Lugufu, which is on the Malagarasi River. At Nyarugusu there is only minor impact on tree cover, with a two year radius of deforestation of 3.2km, while at Lugufu the impact is moderate, with a two year radius of deforestation of 3.6km, possibly increasing to 6.3km. Impacts on habitats and biodiversity are minor (Bitanyi, 1997:6). However, many refugees, particularly fishermen, do not come into the camps, but remain in lakeshore villages where they are integrated to various degrees.

### **3.3.2 Household characteristics**

#### **3.3.2.1 Household composition**

In Tanzania it is normal to find rural households headed by men, if not the husband, then a close kin: a son; a brother; or an uncle, and this was typical of lakeshore villages, where fewer than 10% of households were headed by women. These tended to be widows or divorcées, except in Kirando where women outnumber men by as much as three to two as a result of a tradition of out-migration of able bodied men, and where the strength of the Catholic Church has resulted in some remaining unmarried rather than being part of polygynous households. In other villages, whether predominantly Muslim or not, about 20% of households were polygynous.

Sizes of households varied greatly depending on the type of household and nature of the village. In more town-like communities where it was necessary for many people to stay in one household the size ranged between eight and 18 people, with an average of ten. In smaller villages, however, the sizes range between five and eight with an average of six.

Dependence ratios also varied considerably amongst villages, from as low as 1.0 to as high as 7.0, with an average, of approximately 2:1, which is reasonable given the variety of natural resources available. It should be noted, however, that such an average is usually distorted by differentiation in household's abilities to access these resources.

#### **3.3.2.2 Education**

The educational level of most of the inhabitants of lakeshore villages is low. Although household interview data demonstrated that many respondents had gone to primary school, themed focus group discussions revealed that a considerable number had not finished the required seven years of study. Drop out rates are high as a result of lack of school fees, household demands for labour for fishing and farming, and in some cases, Islamic demands on the youth to attend *madrasat*. Hence, of those who do finish primary school, only a negligible percentage go on to secondary school. Educational levels of women are lower than those of men, although those of the youth are higher than those of their parents. There are exceptions to this picture, however, such as in Kipili in Kirando Ward, where the village government has passed a bylaw stipulating that every school aged child must go to school. This has helped to keep the majority of children in school throughout the year. Educational levels here are a bit higher than in other villages, and a few young people have already gone to secondary schools in other areas while they await the completion of their own secondary school, currently under construction.

#### **3.3.2.3 Health and sanitation**

Each Ward has a health centre, but their services are not generally satisfactory, as they have too few staff for the sizes of their catchments, for example one low level staff member

(nursing assistant, health assistant, etc.) for approximately 6,000 people. There are also not enough medicines, as the health centres depend entirely on the monthly yellow kits, and no operating facilities.

According to the household interview data the most prevalent and/or important diseases tend to be malaria, diarrhoea, and cholera. Health centre records also list other diseases of insanitation such as bilharzia and intestinal worms, infectious diseases such as pneumonia and STDs, and wounds, among others. Poor sanitation is generally a major problem.

Health education is provided to mothers who attend clinics, and according to the interview data, almost all households have access to health education services. However, such knowledge fails to reach men as they do not accompany their spouses to health centre. Thus, although most households have pit latrines, they are not always used, and many people defecate in the lake and on the beach. In some villages women too were observed bathing and washing clothes and dishes in the rivers from which drinking water is taken. In general most households do not boil their drinking water, ostensibly due to shortages of fuelwood, and/or the belief that boiled water does not taste good. Where people do boil their drinking water, such in Buhingu Ward, the success of health educators seems to be based on effort stressing that prevention is better than cure, particularly where medicine is limited, and reference to serious cholera epidemics in the past, but special efforts need to be made by health educators to reach all groups of people in ways which are effective.

### 3.3.2.4 Religious institutions

The dominant religions along the lakeshore are Christianity and Islam, both represented by a variety of denominations. Some religious institutions have built or are planning dispensaries and/or schools, and their co-operation in environmental education may prove valuable in the future.

### 3.3.2.5 Gender relations

***Women's labour and time use:*** Apart from the biological roles of motherhood, women in lakeshore villages spend their time provisioning for their families, cooking, cleaning the house, etc. Much time is also spent outside the house doing agricultural work, petty business, and attending to community development activities. Figure 1 illustrates the daily schedule of a typical woman during the dry and wet seasons in Kirando village. Collecting fuelwood is not reflected here since due to shortages, this activity takes between eight and nine hours. Hence when the need arises a whole day is set aside, normally a Saturday or a Sunday.

**Figure 1: Women's daily schedules in Kirando village**

	Dry season	Wet season
0400		Wake-up, fetch water
0500		Prepare children's food
0600	Wake-up	Leave for fields
0700	Fetch water, clean-up	Farmwork
0800	Breakfast	Farmwork
0900	Petty business, handcrafts, etc.	Farmwork
1000	Petty business, handcrafts, etc.	Farmwork
1100	Visit market	Farmwork
1200	Prepare lunch	Farmwork
1300	Lunch	Farmwork
1400	Lunch	Farmwork
1500	Rest	Go home, prepare & eat lunch

1600	Hair plaiting, handcrafts, etc.	Farmwork
1700	Handcrafts, entertainment, etc.	Farmwork
1800	Fetch water	Farmwork
1900	Prepare dinner	Return home & prepare dinner
2000	Dinner, prepare to sleep	Dinner, prepare to sleep
2100	Sleep	Sleep

Source: Mung'ong'o (Ed.), 1997a

In some villages the workload of woman is increased many fold due to the out-migration of able-bodied men who leave for two months to three years to seek economic advancement elsewhere. Few of these migrants are reported to remit anything home to help their womenfolk cope with provisioning the family.

**Women's control of resources and income:** In the tradition of the Ha and the Fipa the man controls all household resources and income generated. Even when a woman buys a piece of land from the proceeds of her businesses, it falls under her husband's control. Women can only control land inherited from their families of origin. However, the first child of a family, regardless of sex, traditionally inherited the property of the deceased father, including land.

**Women's participation in decision-making processes:** Village governments have been ordered by the Prime Minister's Office to set aside 20% of leadership positions in the village government structure for women. Thus women are, in principle, in a position to participate in decision-making processes at the village/community level. However, most women elected seem to lack the experience and confidence necessary to play an effective representative role, and many can hardly articulate the issues important to them as representatives of their fellow women. There are no meetings to identify and discuss issues important to women, and many ordinary women do not even know that there are women representatives in the village government.

## 4.0 THE ECONOMY

Generally, the livelihoods of the Lake Tanganyika catchment and its shoreline are diverse and include fishing, crop cultivation, mining, and trading in timber and other natural resources. This section outlines some of the major economic activities.

### 4.1 Fish, fishing gears and fish markets

Fishing is the main economic activity depended upon by almost all the people of the coastal villages (Mung'ong'o, 1999). Field data indicate that more than 80% of the households are involved in the activity as fishers, fish processors, or fish traders. Until recently the main fishing gears used in the village were the beach seines, lift-nets catamarans (**kipe**), long lines (**kachinga** or **ndoano**), and gill-nets (**makila**). Currently, however, a majority of the fishermen use catamarans, followed by a sizeable sample still using beach seines, and only small percentage using long lines.

#### 4.1.1 Fishing gears

Traditionally, beach seines were used to catch **dagaa** (*Stolothrissa tanganyicae*) and other littoral fish. The beach seines used in this respect measure between 64m - 100m in length and 10m - 20m in width. They also have 4 ropes in all sides that are between 150 - 200m in length. The seine has between 50 - 60 buoys and 40 medium stones to anchor onto the lake floor. Usually the fishermen use two boats, one carrying the beach seine and the net-pullers, while the smaller boat carries one man who looks for schools of **dagaa**. When the latter sites a school of **dagaa** he calls the crew of the bigger boat to come and start setting the net around the school of fish. Only one trip is done per day, suggesting that the fishery in much of this zone shore is still rich enough to give the fisherman a day's income. To prove this point informants in Mwamgongo pointed out that it was due to the efficiency and lucrative nature of beach seining that the village managed to send 30 Moslems to the Hajj in Mecca which is more than any other village had done in Kigoma or any other region for a long time.

The main problem with this type of fishing is that the seines destroy both fish habitats and breeding grounds by dredging. Another problem is that since the fishermen normally use nets with small holes to maximise their catches, this type of fishing catches both mature and juvenile fish. It is probably due to the proliferation of this type of fishing in much of the zone that the Fisheries Department banned its use. According to the informants in Mwamgongo village, the ban of the use of this fishing method had, however, had adverse effect on the general economy of the village. From the group discussions it was noted that before the ban a total of 20 beach seines were operating in the area. Each of these seines employed 22 fishers - 12 people to tow the ropes and 10 people to shine the lamps. With the ban a total of 440 jobs were lost without compensation. It was for this reason that a considerable percentage of the respondents indicated that they were still using the beach seines despite the ban.

As much as the banning of beach seining could, to a certain extent, have reduced the fish catches and, therefore, the income earning potentials for the people of Mwamgongo, recent political events in neighbouring Burundi and the DRC seem to have affected the economy of villages like Mwamgongo even more. As already noted, both Burundi and the DRC had for a long while provided fishing villages in this zone a lucrative market for their fish catches. With the on-going factional wars in the two countries this market is no longer accessible. So although the ban on beach seining was lifted the fishermen would still not find a market for their catches. Moreover, the fact that fishing (the major means of the economy) is controlled by immigrant catamaran owners from Burundi and the DRC places these villages' economy in the hands of foreigners whose investment interests are often based outside the concerned.

As it will be pointed out below, lift-net catamaran fishing is dominant in this zone. Despite its dominance of catamaran use in the villages of this zone, the catamarans are owned by less than 10% of the well-off households. In some villages more than half of such catamarans belong to refugees from Burundi and the DRC.

Fishermen introduced catamaran lift-net fishing to the eastern shores of Lake Tanganyika two decades ago from the DRC and to some extent by fishermen from Burundi. Now the majority of the fishermen use this type of fishing. The catamarans used in the zone normally have two boats, one net held by four 100m long ropes, 4 hurricane lamps, and 4 fishermen. Normally, catamarans in this zone use engines. However, because the fishing grounds used by these fishermen are still rich enough; and people need not go far to find a reasonable catch some fishermen use peddle catamarans.

This type of fishing is carried out throughout the year with a marked concentration during the months of October-April. There is a slack period during the cool months of May-July as the fish retreat to the lake depths to find food and escape the cool waters that lie on the surface of the lake. Fishing is done every day of each month, except for the nine days of moonlight when the catches are low. Haulage is done two to three times each night. The fish species regularly caught by this technique of fishing include **Dagaa**, *Lates stappersii* (**Migebuka**), *Lates maree* (**Sangara**), and *Limnothrissa tanganicae* (**Malumbu**). This type of fishing is perceived to be sustainable and lucrative for the fishermen, the owners of fishing gears and the business people in general, as more fish are caught under very sustainable conditions. However, because of piracy and increased costs of fishing gear and equipment and the flight of capital from Congolese and Burundian business people fishermen are slowly abandoning it in favour of the banned beach seines which, as we have already seen, are destructive of the fishing grounds. Such shift in fishing techniques probably poses the gravest danger to the sustainability of the zone's fishery.

Long line fishing is mainly done for home consumption, but if the catch is big enough some of it is sold. This type of fishing is usually done using a small canoe peddled by one or two fishermen. With them the fishermen also have 100-150m long lines with hooks lashed with sardines or earthworms. Fishing is done from early in the morning and by 11.00 o'clock the fishermen are ready to go home with a catch to last the family a day or two. Some people go out fishing around 1600 hours in the evening and come home by 1800 hours. Fish caught by this type of fishing include *Tropheus* spp. (**Kiongo**), *Lepidolamprologus* spp. (**Kindurwa**), *Malapterurus* spp. (**Nyika**), *Mastacembaelus* spp. (**Mrombo**) and *Synodontis* spp (**Nkonko**).

#### **4.1.2 Fish processing and marketing**

The catches brought to the lake shore fall under three main commercial interests. The littoral species caught by the beach seines are normally sold on the lake shore with minimum processing for local consumption. **Dagaa** are usually spread by women and children on specially prepared 10m x 20m drying grounds on the beach (locally known as **mbuga**) to dry. The **mbuga** belong to individual villagers who rent them at Tsh. 500 per sack of **dagaa**. The dryers are paid a pail of **dagaa** as charges for the job. and *Lates stappersii* (**Migebuka**) are, however, often dried by fire using firewood brought in from surrounding villages and sold on the local market at between Tsh. 500 - Tsh. 2000 per headload, depending on size and season. Due to such high costs of fuelwood most of the fish is sold unprocessed which reduces its market value. The dried fish is sold to wholesale business men and women who transport it to fish markets in Kigoma and thence to Dar es Salaam and/or Rumonge in Burundi. **Such varied sources of demand complicate attempts at regulating the fishing activity at**

**source. There are simply too many stakeholders at too many levels on the resource utilisation scale.**

As already pointed out, fishing involves a cross section of the community. First of all, there are those who own the fishing gears, and there are those who are employees of such gear owners. Terms of employment are negotiable and temporary. For a peddled catamaran the fishermen get a half of the proceeds while for the engine-powered catamaran they get only a third of the proceeds. The rest goes to the owners to service the engines, the nets, and the owners' families. Thirdly, there are those who wait on the lake shore to process the catches, i.e. take out the entrails, dry them, et cetera. This process is locally known as *kusoloza*. Many women are involved at this stage. The payments for *kusoloza* are always in kind. As explained above, they are usually given some of the fish product that they can either take home for consumption or sell. Finally, there are the middlemen who buy the processed product and transport it to the market far and wide. A change in the fishing industry, as has now occurred in this zone of the lake due to the wars in the DRC and Burundi, will thus affect whole communities in the area.

Both Burundi and the DRC have for a long while provided fishing villages of this zone with not only a lucrative market for their fish catches, but also sizeable capital investments in form of lift-net catamarans and cash. In Mwamgongo village, for example, although about 94% of the fishermen practised lift-net fishing there were only 25 catamarans. Of these 11 catamarans belonged to individuals in the village while 14 were brought in by the refugees from Burundi and the DRC (Mung'ong'o, 1999). Since the immigrant catamaran owners controlled the major means of the fishing economy in the village the economy itself was squarely placed in the hands of these foreigners whose investment interests were based outside the village and/or country. **With on-going conflict in the these countries two things happened: a) the market in the two countries which was the motive force of the fishing villages' economies disintegrated and, b) with it the immigrants' capital also left this zone's villages, leaving impoverished and dejected communities.**

A probably positive effect of the disintegration of the fish market is on the biodiversity of the due to slackened exploitation of the fishery. With political stability forthcoming in the two countries the fishing economy of Mwamgongo could most likely also rejuvenate. How a rejuvenated economy would affect the exploitation of this fishery's biodiversity is, however, difficult to assess at the moment.

Due to the large surface of exploitable waters and the existence of distinct fishing grounds little conflict was observed between use of fishing gears. Even when the wind pushed the fish in the inner parts of the bays and the night seines joined the other beach seines, there were no conflicts among fishermen. The major source of conflict was the share of the catch or payments to the hired fishermen.

The nature of this economic activity in the southern zone has been detailed in Mung'ong'o (ed.), 1997). The main fishing gears used are the catamarans using lift-nets to catch *Lates stappersii* and/or *Stolothrissa tanganicae*. Long lines are also widely spread in the bay or around the islands. The lamparo beach seines are used to catch sardines. Some beach seines are used to catch inshore fish and are locally known as *kokoro ya samaki* or *mkwau wa samaki*. Gill-nets are also widely used. Other fishing gears of minor importance include *kabuti* and *mgonono*. The former is a scoop-net of 1" mesh operated in very shallow waters close to the shore during the night. One or two men paddle along the shore using one pressure

lamp. When they see an immobile fish they come as close as possible and drop the net silently in front of the fish. Then one fisherman hits the water with a paddle frightening the fish. The fish in panic rushes straight into the waiting net. The *mgono* is a trap made of reeds and set in the streams entering the lake.

Generally, many fishermen were of the opinion that their fishing gears, especially nets and vessels, were too old and technologically out-dated to be as profitable as they could wish. Problems constantly mentioned included:

- lack of proper lamps which allow the light to reach deep layers where schools of Clupeids live
- old boats do not allow fishermen to go far enough
- lack of powerful engines
- nets were not wide enough to allow good catches; and
- lack of credit to enable gear owners to renew the fishing fleet.

The trend in the near future, assuming that the problem of piracy stabilises, will probably be that traditional catamarans will be abandoned for the bigger and more expensive Apollo catamarans. This means that if the Kigoma and Rukwa lending institutions do not support local investment in fishing the new fishing fleets will belong to neighbouring countries' investors (cf. Mung'ong'o, Forthcoming).

The main difference noticed between the northern and the southern parts of Lake Tanganyika is that in the south fishermen catch Clupeids at daytime, close to the shore. The local fishermen call this *Uvuvi wa mawindo ya mchana* (Day hunting fishery). At daytime the fishermen use two boats, one carrying the beach seine and the net-pullers (8 to 10) while the other which is smaller carries two men who look for schools of Clupeids. When the latter boat site a school of fish they call the crew of the bigger boat to come and start setting the net around the school of Clupeids. Every day the activity starts at 06.00 and lasts to 11.00 when the crew rests before starting again at 15.00. The evening session lasts up to 18.30. Before it is sold the catch is normally spread on the sand to dry by people, usually women, who do some *kusoloza*. If the catch consists of *Limnothrissa miodon* smaller than 25mm (usually known as *kasekese*) it is spread on nets lying on the beach not on sand.

Clupeid beach seines use light boats and operate as described in Petit (1997). Fish beach seiners rarely operate at daytime because the catch is low. Neither do they use light boats when operating at night. They instead wait for the new moon period when the fish comes close to the shore. Hence fish beach seiners start their work at about 17.00 just before dusk and finish at 04.00.

As already noted, before the introduction of lift-net fishery Kirando fishermen were using scoop-nets. They abandoned the scoop-net fishery due to competition with the lift-nets, particularly the number of lamps. The fishermen also pointed out that light boats can push the Clupeids towards the beach for the first haul, but later, as the other light boats remain offshore, it is not possible for the first light boat to come back and expect to attract fish once again for another haul. In the process the catch keeps dwindling as the catamarans provide a wall of light between the offshore and the onshore side where the small *kaweselo* boats operate.

#### **4.1.3 People's perception of the fishery and the environment**

People's perception of the long term sustainability of the fishery in the study area differ from village to village. In Kipili, which is an old fishing centre with an established culture



influenced by Christianity, interviewees demonstrated a high level of awareness of this issue. The fishermen were, for example, aware of the Fisheries Act of 1970 that prohibited the catching of "small fish". Hence there was no market for such fish in Kipili in the past. However, with the coming of piracy, the team were told, people started limiting their fishing activities closer to the shore. They also changed to using smaller meshes. Now they can catch both small and big fish. The small fish has to be marketed. So nowadays they have a market for such fish as well. Furthermore, the team learned that *Kasekeseke* and *Mpande* are used as chicken feed in Zambia; so the demand has increased, encouraging the fishing of these juvenile species.

Although there is lack of unanimity in this issue, most fishermen in Kipili believe that the fish is disappearing globally because of the improvement of fishing techniques and the use of small meshes "which catch the fish with their eggs". The lack of unanimity among the respondents probably suggests that there are fluctuations in the abundance of fish through the years. It could also be that there has been no systematically witnessed degradation of the littoral fish stock.

The fishermen in Katete demonstrated the worst side of the picture. Most interviewees seemed not to care about over-exploitation or sustainability of resources. The fishermen at Kipili probably described them well when they said: "Fishermen at Katete are not real fishermen, they go fishing some days and as soon as they get some money they stop fishing to drink until they have no money left; then they go back fishing." Such resource users have no incentive to conserve resources.

#### **4.2 Crop cultivation**

The majority of the population of the Malagarasi Catchment are small subsistence farmers. Commercial farming is limited to cotton and coffee production on a small scale. Otherwise most of the areas in the district rely on crops like maize, bananas and beans as a source of income. The trade in beans and maize has also increased in the last few years as a result of a growing market for these food crops in neighbouring Burundi. They often keep the long-horned Ankole cattle and some small animals like goats, sheep and chicken.

The majority of the people in the Highland Zone cultivate an estimated value of 3.6 acres per household. Farm plots in the Intermediate and Miombo Zones are much bigger; averaging 6.5 and 6.2 acres per household, respectively, with some people cultivating as much as 25 acres of land. More than two-thirds of the land in the Intermediate Zone and almost all of the farmland in the Miombo Zone has been reclaimed from natural Miombo woodland. An insignificant number of households in the two zones has inherited the land they cultivate from their parents.

The hand hoe is still universally used in agricultural operations in the three zones. Some ox-ploughing is, however, also practised by a small percentage in the Highland Zone of Kasulu District. No inorganic fertilisers are used in the three zones. Fertilisation by animal manure is applied by less than a half of the households in the Highland Zone and less than a quarter of the households in the Intermediate Zone. Non-use of inorganic fertilisers is universal due to their high prices (especially now when there are no government subsidies) and relative unavailability.

Every household in the three zones cultivates. The main crops grown include maize, beans, cassava, groundnuts, sweet potatoes, bananas and coffee in the Highland and Intermediate

Zones, respectively, and maize, beans, paddy rice and to some extent cassava in the Miombo Zone. Beans, coffee, cotton, maize and to some extent bananas comprise the main cash crops grown in the study area.

Yanda and Mung'ong'o (1997) observe that mono-cropping is not a very common practice. Although it occurs in at least a quarter of the farms in the Intermediate and the Miombo Zones, intercropping is the most common cropping pattern practised in all the three zones. More than three quarters of all the households in the three zones do inter-crop their farms. There is, however, a clear decline in intercropping as farm sizes increase through the transect from the relatively poor soils of the Highland Zone through the large farm plots of the Intermediate Zone and into the almost unlimited land resources of the Miombo Zone. The farm sizes of the latter zone appear to have impeded intercropping.

Decreasing land fertility is a problem in the region. In the Highland Zone people tend to cope by using farm yard manure. Keeping of livestock in this zone is, therefore, not only a means of accumulating wealth and insurance for bad times; it is a vital complement to crop production. Yanda and Mung'ong'o (1997) show that 46 and 40 percent of the households interviewed in the Highland Zone kept cattle and goats, respectively. Only 14 and 34 percent of the households interviewed kept cattle and goats in the Intermediate Zone, respectively. None of the households in the Miombo Zone kept any cattle due to tsetse fly infestation. For the households that kept livestock, the herds were observed to range between 6-15 for cattle and between 6-12 for goats. Very few households owned sheep in all zones.

There is relatively little integration of livestock keeping and crop production in the Intermediate and Miombo Zones where historically cattle mortality has prohibited livestock raising. Use of inorganic fertilisers is also very minimal due to their being unaffordable. Furthermore, access to extension services is very variable within and between villages. Consequently, more land is cleared farther into the Miombo woodlands, effectively extensifying the farming system into the latter zone.

The crops grown in the Miombo Zone are mainly for sale. After harvest some of the bean crop, for example, never reaches the homesteads of the farmers. The farmers send the crop directly to the market in Kasulu and Burundi themselves or their agents on bicycles. Sometimes it is sold on-farm to speculative middlemen. The ecological effects of the expansion of this farming system has invariably been extensive and often indiscriminate clearing of woodlands, resulting not only in the creation of open grasslands similar to those of the Highland Zone, but also in substantial wood fuel problems in the area. People who extensify their farming into the Miombo woodlands, however, still consider the abandoned land in the villages of origin as theirs, demonstrating that people are aware of the disappearance of the virgin Miombo woodland and that some day they may have to go back to their land and intensify their farming system. This is exemplified by the few who opt to remain in the Intermediate Zone villages like Ruhita, despite the declining productivity of the land. These people are now keeping cattle and using farm yard manure to improve soil fertility. Others have changed their cropping patterns to include such new crops as bananas and oil palms.

Yanda and Mung'ong'o (1997) further observe that there has practically been no major change in the types of crops grown in the three zones for the last five years. The situation was not always like this. In the early 1900s the popular form of agriculture in the Highland Zone villages such as Msekela was shifting cultivation. The traditional crops grown in the area

included bulrush millet and sweet potatoes. Land was plentiful and fertile. Maize and bananas were introduced much later from Burundi. Farmers practised a cultivation cycle of approximately five years followed by another five years of fallow. The low population density and the late introduction of cattle which precluded the possibility of integration of animal traction in tillage and use of manure for soil improvement made shifting cultivation the main form of agriculture suitable in the zone.<sup>6</sup> However, only half of the households in the lake shore area are involved in crop cultivation ostensibly due to shortage of arable land (Mung'ong'o, 1999). The main crops grown include cassava, beans, oil palms, maize, and sweet potatoes. Some few individuals are experimenting with coffee growing in the highland areas. The area cultivated is very small. A majority of the households cultivate only between 1 - 2 acres, followed by those who cultivate between 3 - 4 acres. Most of the land owned is inherited, some of it is bought, while the rest is rented.

Productivity of the land is very low due to lack of management, land degradation and lack of extension services. A majority of the cultivating families get only between 4 - 6 bags of cassava. A substantial percentage of the households get only between 1 - 3 bags. Only a small percentage of the cultivating households get more than 7 bags of cassava annually. Self-sufficiency in grains and other sources of carbohydrates is, therefore, very low in this zone, putting more than one third of the households below the food security line. More than 90% of the households are thus dependent on food purchases (Mung'ong'o, 1999).

There is little livestock keeping in the coastal communities of this zone. Less than a third of the households keep some goats, chicken and geese. There are on average about 5 goats and 15 chicken/geese per household. There is a negligible percentage of households owning cattle.

Generally, the Ufipa Plateau and the Southern Lake Zone has a total of 311,626 hectares under cultivation. Of these 286,491 hectares are under small scale agriculture while 25,135 hectares are under large scale agriculture. Agricultural expansion has been based on extensification of land rather than intensification. For example, in 1997 a total of 101,018 hectares of food crops and 16,672 hectares of cash crops were put under cultivation in Mpanda District, and 175,447 hectares were put under cultivation in Sumbawanga Districts. This was against 96,544 and 153,619 hectares cultivated in 1996, respectively. Meanwhile, the number of ox-ploughs in Rukwa Region had increased from 52,800 in 1996 to 55,000 in 1997. The number of livestock had also increased from 469,218 cattle and 115,657 shoats in 1993 to 556,428 and 160,457 shoats in 1996.

### **4.3 Mining**

The major industry in the catchment is the salt production carried out by the Nyanza Salt Mines (Ltd) at Uvinza in Kigoma Rural District. The mine situated on the confluence of the rivers Malagarasi and Ruchugi began its operation in 1925 and the industry is currently producing around 7,000 tons of vapour dried salt per annum. The main source of energy is woodfuel, though sun drying is also used during the dry season. At full capacity the thermal plant needs about 51m<sup>3</sup> of wood per day. The residues from the burnt wood are deposited or dumped in the Malagarasi. Excess brine, some chemicals and dirty oil are also released into the river. The rate of water pollution by such dumping has, however, not been established.

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<sup>6</sup> Interview with Mzee Bhalireguye Nteze "Sanduku", 18th September, 1996.

Gold mining is done in Mpanda District on a small scale basis. It currently involves about 1,500 people. The main environmental threat is the use of mercury in gold binding. If not handled well the mercury residues could be potential pollutants of rivers used by the miners to process their gold. This is, however, not an immediate problem to Lake Tanganyika, as all rivers passing through the mineral fields discharge their waters into Lake Rukwa.

#### **4.4 Other livelihoods**

There are very few other economic activities apart from the fishing- and agriculture-based activities discussed above. The few activities include running of shops, restaurants, vending of foodstuffs in the market and handcrafts. The shops and restaurants are fairly small selling basic household items and foods, respectively. Bedsheet embroidery is the main handcraft performed by women in between their other household chores. The colourful bedsheets can fetch up to Tsh. 20,000 a piece.

The other activity, which preoccupies a significant number of women in the coastal communities, is palm oil production. Villages like Mwamgongo have sizeable areas of land under oil palms. Women who specialise in this activity buy the palm fruits from local palm owners at a stipulated price and press them using a crude locally made machine. Another person almost always owns the machine and hence its use has to be paid for; usually in an agreed number of litres of the final product.

There are two kinds of oil produced from the palm fruit, i.e. the red oil produced from the mesocarp, and the white one, which is produced from the kernel. A litre of the former sells at around Tsh. 400, while that of the latter sells at around Tsh. 600 in Kigoma. These prices tend to double during periods of high demand (Sanze, pers. comm.).

People in the coastal area depend upon four major economic activities, namely agriculture, fishing, livestock keeping and business that differs from one village to another. For example, in the *kitongoji* of Mtakuja in Kirando there are businesses characteristic of urban areas. Such businesses include big shops, restaurants, guest houses and a thriving market. The other villages, on the other hand, have fairly small businesses such as small shops and kiosks selling basic household items. A major business venture in all the surveyed is the processing and selling of fish and fish products. Another popular business in these villages is the brewing of local beer. In all villages this is essentially a business monopolised by women. Although there are credible rumours that the illicit liquor *Gongo* is brewed and widely consumed in all the surveyed villages, the most popular and most strong beer is *Wanzuki* made from honey. Other common beers include *Komoni* and *Kisusano*, which are made from maize or *muhogo* and finger millet. As both of these ingredients are basic foodstuffs the proliferation of brewing of these beers may contribute to food shortages in some villages. Alcohol abuse is very high in most villages.

#### **4.5 Labour use and availability**

Family labour is predominantly depended upon in this zone, both for agriculture and fishing. However, in times of crisis in the agricultural season, such as during weeding and harvesting periods hired labour is preferred to use of work parties, suggesting that people in fishing villages like Mwamgongo are becoming more and more individualistic in their attitude to economic production. It also suggests that the labour of relatives has acquired monetary value and can no longer be freely called upon as social capital during times of labour crisis. During the dry season women's labour is shifted into fish processing, fish trading and/or palm oil production. Thus making women the most overworked social group in the communities.

The cost of hiring labour is high by rural standards. For example, the cost of tilling an acre of land ranges between Tsh. 25,000 and Tsh. 30,000. The costs vary according to the type of shamba that is being tilled. The more weeds it has, especially the weed **Rumotomoto** (*Imperata cylindrica*), the more it would cost to till. Households with some fishing gear and those, which depend on fishing alone, use both their male youths and hired labour as hands. Hence during the fishing season many youths leave school and migrate temporarily to the fishing grounds. Here the women are usually involved in fish processing and fish trading almost full time.

As noted in Section 3.2.1 family labour is still depended upon in most of the coastal areas of Lake Tanganyika, both for agriculture and fishing. In times of crisis in the agricultural season, such as during weeding and harvesting periods, however, hired labour (*kibarua*) is preferred to use of work parties. The reason for this could not be ascertained during the PRA studies. Although the cost of hiring labour is slightly cheaper here than in the Malagarasi-Luiche Catchment Region, they are still high by the standards of many rural communities. In Kirando, for example, a rice farmer pays Tsh. 11,000 to hire someone to till an acre of land and Tsh. 16,000 for someone to transplant the seedlings. The total cost from the preparation of the farm to the time of harvest could range between Tsh. 36,000 and 40,000 - costs that very few households can afford. Here too households with some fishing gear normally use their youths as labour in fishing activities. Only when that labour force is insufficient are outsiders hired. Hence during the fishing season many youths leave school and migrate temporarily to be employed in the fishing camps.

#### **4.6 Access to credit and other financial resources**

Apart from the resources of lake and land, which are the basic sources of income for the people of coastal communities like Mwamgongo, there are very few other financial sources accessible to them. According to field data only TACARE seems to offer educational grants to girls selected from local schools to join various secondary schools in the country. TACARE has also initiated a revolving fund to support a Savings and Credit package for women groups in some villages. A full time Community Development Officer is stationed in Mwamgongo to co-ordinate this project.

In addition to the lake and land resources there are several institutions which have shown willingness to offer loans and various aid packages to the people of the area. Such institutions in Rukwa include the Rukwa Association of Non-Governmental Organisations (RANGO) which offers small loans as seed money to various local economic groups. The other institution is the International Fund for Agricultural Development (IFAD) who have recently helped the local Department of Agriculture with working tools (including the much needed transport facilities) and technical know-how. Other institutions include GTZ (whose involvement is concentrated in issues of food and nutrition), and the World Food Program which gives out small loans to help simple animal husbandry in some areas. There is also a revolving Women's Development Fund provided for by the Government of Tanzania. In Kigoma Region such institutions include international NGOs such as Care International, Africare, and others which apart from servicing the refugees also offer some financial resources for the development of local communities. (Section 4.0).

The problems that face many of the people getting loans from these institutions include delayed repayment and/or non-repayment of such loans. These problems have come about because a majority of the people who get these loans invest them in agriculture which is

fraught with problems of poor technology and unpredictable weather. Those who invest in fishing claim that business is not so certain these days. Catches have declined as buyers have increased in the market making business unpredictable and very competitive. As a result, the price of a 50 kg bag of Clupeids could rise dramatically from Tsh. 12,000 to Tsh. 50,000 in a very short time. Such market fluctuations send many small business people out of business (Mung'ong'o (ed.), 1997).

#### **4.7 Use of other natural resources**

According to the interview data the other main natural resource, other than land and the lake, used by the people of the coastal areas of this zone is wood from the local forests. Local people for woodfuel depend upon the local forest, for charcoal and for building poles, timber and/or thatch grass. Very few people use the local forest products for anything else, possibly due to the formidable distances and steep slopes, which have made access to the forests difficult. Tree planting is seen by many of the respondents as the solution to the ensuing shortage of firewood and building material. However, it was clear during the Mwamgongo study that few people had come forward to utilise the tree seedlings raised by TACARE in the village.

#### **4.8 Women's control of resources, income and decision-making processes**

According to the tradition of the Waha the man controls all resources, including land and income generated within a household. This is confirmed by the interview data, which demonstrate that although the woman contributed to the household income the same percentage as her husband (if not more in some households) the main decision-maker in the household was almost always the man. Only a few households indicated that both partners shared in the decision-making process. In female-headed households the woman made all the major decisions concerning their households.

Nevertheless, women awareness of this anomaly is relatively high in villages like Mwamgongo. During the focus group discussions in the village, for example, one of the solutions suggested for the six problems listed was to fight for more women representation in the village government and other leadership positions.

## 5.0 INSTITUTIONAL APPRAISAL

The purpose of this appraisal is to examine institutions that have a bearing on the stakeholders in the Lake Tanganyika Basin. Institutions for our purpose are orderly, stable, and socially integrating structures through which people come together to discuss issues and make decisions. These range from the family to the government. In between there are a variety of formal and informal institutions, including local community groups, NGOs, and various other groupings of people. In this section the paper describes the relevant government institutions, local institutions, and non-government organisations dealing with issues of development related to the management and/or conservation of the Lake Tanganyika Basin in the Malagarasi-Luiche Catchment.

### 5.1 Government institutions

Several government institutions were visited and interviewed in the five districts. These included District Natural Resources Offices (incorporating Wildlife, Forestry, Fisheries and Beekeeping sections), Departments of Health, Departments of Agriculture and Livestock, Departments of Community Development and the Departments of Water. The main observation made was that all the departments lack basic resources. Recent manpower retrenchments have reduced the capacity of some departments. Departments such as Natural Resources and Agriculture and Livestock who have to constantly monitor and control natural resource use and help develop the agricultural system through extension services have had their field staff reduced by 60%. Moreover, they have no transport to reach their areas of operation. Departments such as Health and Water now depend on transport facilities provided by donor agencies and/or international NGOs working in the districts. Nevertheless, some departments cannot even maintain such cars due to lack of recurrent funds.

### 5.2 Local institutions

Wagner (1996) notes that there has been great continuity in the institutions and beliefs that govern the utilisation of the environment but the institutions have passed through several discernible phases of development.<sup>7</sup> Before the coming of the *Baami* kings of Tutsi origin into the country of the Waha the *Bateko* priests enjoyed unrivalled authority. However, when the *Baami* kingship took root in the area in the seventeenth century the *Bateko* priests began to share both their authority and the supervision of sites of worship with the *Baami* kings and their ritual specialists.

With the coming of the Caravan Trade from the Indian Ocean the position of *Bateko* priests took on an economic value. The priests started taking inflated amounts of tribute from coastal merchants who wanted authorisation to build trading stations and from Waha farmers who sought security from famine, pestilence and other calamities that might expose them to enslavement. Under colonial rule the *Bateko* priests were often incorporated in the British Administration by being offered positions of sub-chiefs. Today although the individuals who are rightful heirs to the traditional positions of power can still be identified among the Waha society, the rituals they were responsible for and the power they derived are no longer tenable. The *Baami* and *Bateko* groups of leaders have been able to survive modern Waha society through an intricate system of power relations determined by the One Party political system.<sup>8</sup>

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<sup>7</sup> Wagner, M. (1996). Environment, community and history. Nature in the mind in nineteenth and early twentieth century Buha, Tanzania. In: *Custodians of the land. Ecology and culture in the history of Tanzania*, edited by G. Maddox, J. Giblin and I.N. Kimambo (James Currey, London); pp. 175-199.

<sup>8</sup> See Mung'ong'o (1995:43-48) for an elaboration of this in the case of Kondoia Irangi.

Similar developments pertain to the Wafipa and other smaller ethnic groups in Rukwa Region. Historically, the transfer of decision-making in Tanzania from local communities to state-controlled institutions began during the German colonial times (1885-1918) and continued into the British era (1919-1960). The resulting institutional structures were inherited by the post-independence state in 1961. The transfer was, however, never complete in many respects. Officially, the traditional institutions that had governed local resource use were superseded by state-controlled institutions. The state also appropriated the legal ownership of natural resources such as land and water. In reality, however, the management and use of these resources has in many places continued being mediated by traditional tenure regimes and other local resource use arrangements.

Currently, however, the predominant socio-political structure at the local level is the one prescribed by the Villages and Ujamaa Villages (Registration, Designation and Administration) Act of 1975 and the Local Government (District Authorities) Act No. 7 of 1982 which repealed the former. Under the 1982 Act each village should have a Village Assembly (VA). All members who have attained the age of eighteen years and above and who are ordinarily resident in the village are automatically members of the village and hence of the VA. The VA is empowered to elect a not less than 15-member and not more than 25-member VC as its governing or executive arm. It is also supposed to retain the power of recall of any or all of the members of the VC. At least 20 per cent of these members must be women. Using these representative positions women are in principle in a position to participate in decision-making processes at the village community level.

All the villages visited in the catchment indicated a close adherence to the formal organisational structure. They all had 25-member VCs organised into three executive committees, namely Finance and Planning (FP), Security and Defence (SD), and Community Development and Social Services (CDSS). There are, however, minor divergences as regards the type and number of sub-committees. For example, while the VC in some villages had sub-committees on Community Discipline and Basic Health constituted under the CDSS Committee, other villages had sub-committees on Community Discipline and Arbitration under the CDSS Committee. Such divergences are of particular interest to the LTBP, as they demonstrate that **villages are able to create new institutions under the umbrella of the VC to cater for special local organisational requirements such as environmental management and/or conservation. Nevertheless, popular participation in the socio-political life seems to be generally low in many villages.** For example, while the village leaders interviewed in all the villages reported that VC meetings were held regularly as required by the Local Government (District Authorities) Act, these reports were not corroborated by some of the ordinary villagers interviewed. Neither could minutes of recent meetings be produced in any of the villages visited to support the leaders' assertions. Furthermore, the problems of lack of experience and confidence necessary to play an effective representative role have been a major setback to people's representation. This situation is particularly serious for women representation. As already stated above, many women are hardly articulate enough to effectively represent their fellow women. This would seem to confirm the assertion made elsewhere **that formal institutions at the village level**



**are more instruments for the enforcing of regulations and orders from the higher administrative levels than instruments of grassroots democratic representation.<sup>9</sup>**

The reason for this situation is historical. It has always been the Central Government that has determined village life. It has done this through a variety of operations and legal acts. It has determined, for example, where villages and individual homesteads should be located; who should live in a particular village and the nature of social reproductive activities that could be conducted. In this respect it has even regulated the types and amount of crops that could be grown; the acreages of each crop and the agricultural methods to be used. Such patronisation has somehow deskilled the people and killed the capacity and initiative to play a meaningful role in local politics.

### **5.3 Development agencies and NGOs**

The NGOs visited in Kasulu Districts included international institutions such as CARE International, Africare Tanzania, and Christian Outreach. These are international relief and development agencies that came into Kasulu and Kigoma Districts to serve Congolese and Burundian refugees, refugee affected areas, returnees and children. They are currently operating as UNHCR implementing partners in refugee community services such as education, health, care of vulnerable people, etc. Recently most of these institutions have opted to extend their activities to include local development issues such as environmental conservation, rehabilitation of and capacity building in the local health and education services and infrastructure. Africare Tanzania are also extending their activities into the financing and co-ordination of the establishment of small scale income generating activities/enterprises (e.g. dairy cattle raising) by local groups.

Local NGOs included the Rural Services Programme of Tanzania (RUSERP) and the Diocese of Western Tanzania (DWT). RUSERP is a Trust Fund set up in 1995 in Karagwe to respond to "all problems related to the alleviation of poverty, rehabilitation of both rural people and the surrounding environment, rural development and relief services." RUSERP moved into Kasulu in 1997 and is currently operating as an implementing partner of the UNHCR in education in refugee camps, distribution of food, and training of trainers in improved stoves, afforestation, environmental education, small scale entrepreneurship and general community development techniques. The DWT has a unit within the Diocese that offers extension services to the villages. Currently, their emphasis has been in afforestation, development of energy saving stoves, biogas, irrigation and oxenisation of agriculture.

Another local NGO that is active in Uvinza is Exploit and Help Nature (EHENA). The NGO was instituted in 1997. Currently it has 15 members and aims to improve and promote the quality of education, health services and environmental integrity in Kigoma Region. Their environmental activities are confined in Uvinza Ward where EHENA is presently collaborating with RUSERP in raising of seedlings and distributing them to villagers. They also offer environmental education to the concerned villages, especially to counter burning which is common in the ward. Like their counterpart DWT in Kasulu these people lack funds and the expertise to fulfil their objectives. There is also a women's association called Uvinza Women Association. The association was instituted in 1997 and deals with, among other

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<sup>9</sup> Kauzeni, A.S., E.K. Shishira and C.G. Mung'ong'o (1988). People's organization at village level. A case study of four villages in Rukwa Region, Tanzania. (Institute of Resource Assessment, University of Dar es Salaam, Research Report # 76).

things, environmental conservation in Uvinza through the promotion of the use of improved stoves and afforestation. They work closely with such NGOs as RUSERP and EHENA.

Except for the DWT and other nascent NGOs all of the international NGOs existing in the area came into Kigoma Region in response to the refugee crisis in the region. Their interventions, be they infrastructural, educational, environmental, etc, tender to the needs of refugees. It is only now that some of these NGOs are revising their outlook to include the surrounding communities into their activities. This raises the question of sustainability - whether after the refugee crisis is over and the refugee funds dry up these institutions will still have the motivation to continue working in the area. The home grown NGOs like DWT have enthusiastic and honest people working for them, but they lack funds and expertise to be effective in their interventions.

In Rukwa Region the main NGO is the Rukwa Association of Non-Government Organisations (RANGO) which is an umbrella organisation incorporating 17 NGOs in the region. Most of member NGOs deal with environmental conservation. An outline of the history of some of these NGOs highlights the character of these institutions. RECOSO was established in 1993 and was eventually registered the following year. Currently, it has a membership of 15 people mainly composed of retirees from the Department of Lands. Its main work to-date has been environmental conservation through afforestation. It began its work at Kantalamba and expanded to other areas around Sumbawanga town. It has also trained various groups of citizens of Rukwa in matters of environmental management. They have expertise on land issues, forestry and gender. The main problems have been lack of funds and equipment.

*Tujaribu Vijana Group* was established in 1994 but began its work in 1996. It began with a membership of 5 people and has today grown to 15 people. The objectives of this organisation were to give the youth an opportunity to employ themselves and educate the local population in environmental management and conservation. They have expertise in forestry, accounts and health. Their work includes production of tree seedlings and tree planting in various urban and rural areas of Sumbawanga. The organisation has benefited from various donations, including those from GTZ, NPF and the Regional Commissioner's Office. Like RECOSO they are short of funds and lack knowledgeable and hence effective leadership. As a result of these problems people's response in joining the organisation has been low.

The umbrella organisation RANGO was started by an order of the Regional Commissioner in an effort to have just one organisation through which donor funds could be channelled into the region. Bureaucratic inertia which is characteristic of such umbrella organisations and mismanagement in individual member organisations has led to acrimonious relationships between RANGO and some of its member organisations. Some new NGOs, e.g. the MPECO of Mpanda, have as a result been wary of compliance.

There is a proliferation of NGOs of all sizes and capacities. Most of the local NGOs, however, conceptualise environmental conservation as equivalent to **afforestation**. Other conservation measures are not in vogue possibly due to the dominance of foresters in these institutions. Management is a major problem in most of these NGOs. Many of them are run as one man's shows, while others are groups of people with vested interests and ulterior motives. Shortage of funds, lack of knowledgeable and effective leadership are other major problems besetting these organisations.

## 6.0 CONCLUSION AND AREAS FOR FUTURE RESEARCH AND INTERVENTION

### 6.1 Conclusion: conservation or sustainable utilisation?

For many of the populations along the lakeshore agriculture is a secondary activity. This, however, is only true for the narrow strip of the lake shore. Inland many people are primarily herders or farmers or both. In the main, even those whose primary activity is fishing do some subsistence farming. Agriculture, therefore, seems to have the greatest impact on the lake and lake shore environment, whilst on the surrounding catchment hills deforestation could be playing a greater role.

While the soils in the catchment areas are mixed, ranging from dark red clay loams of Kasulu to the simple red loams of the Ufipa Plateau, generally sands and clays of low fertility predominate the coastline of the lake. The soils hold little water. The main crops in these areas are cassava with rice on the seasonally flooded valley clay areas.

The main livestock are cattle. Other animals include goats, sheep, ducks, chickens and the occasional pig. The immigrant Sukuma agro-pastoralists are believed to have increased the number of animals and hence are held responsible for much erosion and loss of crops through overgrazing. On the positive side the Sukuma, have also brought useful new technology through the introduction of ox ploughing and helped intensify agriculture in the area.

Horticultural activities are limited to a few low riparian strips and patches along the lake shore. They do not form a major contribution to the local trade or diet. However, by the nature of their location can effect the aquatic system.

The largest impacts on the environment were seen to originate from seven major factors:

- new shambas encroaching onto banks and the lake shore where the sandy soils are easily eroded and swept away during the rains;
- low intensity agricultural practices without sufficient fallow periods leading to soil exhaustion and constant expansion into new areas. This may also be linked to a lack of knowledge of alternatives;
- agriculture taking second place to fishing to the extent that certain issues are not addressed despite the apparent possession of relevant knowledge;
- heavy cattle pressure in some areas;
- burning of vegetation to encourage fresh grass in the open grazing areas; and
- heavy deforestation on the catchment hills for timber, woodfuel, and building poles;
- a lack of local by-laws and joint action.

Although the general level of environmental understanding seems to be reasonable, it varies substantially between individuals and communities. The commitment to effect any change is, however, far less for a number of reasons. The reasons include the perception gap, the politics associated with conservation, and the educational levels of the target communities.

#### 6.1.1 Perception gap

It has been noted that officials and local land users often have different perceptions about environmental problems (Ayling, 1995; Kikula, 1986). While the official view is drawn from references to the little available data, often derived from generalising science, farmers' views are based upon observations, local values, and experience. The final interpretation of change in some indicators and the assessment of its impact on natural resources is thus often coloured by such differing backgrounds. One study, for example, established that despite

extensive gullying in one village in Kondoa District the villagers did not perceive it as a major problem due to the fact that many of them had grown up seeing degradation as a natural formation in the landscape (Dejene *et al.* 1997:18). It was pointed out in Section 4.2.3 that although there is lack of unanimity in this issue, most fishermen in Kipili believe that the fish is disappearing globally because of the improvement of fishing techniques and the use of small meshes. It was argued that lack of unanimity among the respondents probably suggested the existence of fluctuations in the abundance of fish through the years or that there has been no systematically witnessed degradation of the littoral fish stock. **Enhancing the fishers' ability to correctly interpret changes according to the new circumstances and improving local knowledge by intermarrying it with scientific knowledge is the challenge which faces researchers and development workers in the Lake Tanganyika basin** (Hausler, 1995).

From a practical point of view, many of the farming families say proposed change would affect current agricultural practices and increase work load. Sometimes there is no motivation to change since every one else is doing the same thing. In the case of deforestation, trees whilst low in number in the main valleys are not seen as being particularly important in the area. On the other hand, **whilst soil erosion is recognised it does not seem to have reached the point where people feel the need to do something about it; partly due to the fact that people can still get access to other land if they need it.**

#### **6.1.2 The politics of conservation**

**Many rural inhabitants in Tanzania are suspicious of the intentions of outsiders who come in with offers of help or new ways of doing things in their communities. Bad experiences with previous state interventions are often the reason for this attitude.** Dejene *et al.* (1997:20) found out, for example, that in one village many people who had said that they practised conservation measures in their farms had not in reality done so. The researchers came to realise later that most of their respondents were environmental refugees from a degraded highland area where heavy destocking and population resettlement had taken place a decade earlier. By admitting that they did not practice any conservation measures in their farming practices was to admit that they were responsible for transferring the degradation process to the new area, thus inviting unpopular measures as happened in their former home area.

In other cases, however, it is a matter of personal pride; as when the same study found out that although terracing was reported in interviews to be widespread in one village, field verification indicated this was not the case (Dejene *et al.* 1997:19). The study found out later that terracing had been one of the technical packages recommended by a conservation project in the area. People would, therefore, not like to admit that they did not practice something they were supposed to know and apply. Forest fires and river bank damage in the Lake Tanganyika catchment are cases in point. Whilst recognised by many the problems are not fully appreciated by everyone.

#### **6.1.2 Low levels of education**

The educational level of most of the inhabitants of rural Tanzania is very low. In this synthesis we have seen how those who have gone through primary school had not been able to finish the required seven years of primary education. Many had left school at an early age to get employed in fishing or harvesting and processing of paddy. Any environmental education programme instituted in the area should take consideration of this, as it has an implication on the choice of methodologies of learning and imparting of knowledge which

can be chosen and applied. The situation among women is particularly dire. While they are the worst affected educationally they are the only social group which has shown awareness of the problem of deforestation and the resulting soil erosion and are willing to take joint action to solve them or ameliorate their effects.

## **6.2 Knowledge gaps and areas for future research**

### ***6.2.1 Impact of fishing practices on the lake biodiversity***

The studies reviewed in this report point out that continued application of the banned **beach seining** is a major problem in the Lake Tanganyika coast due to its bad environmental effects. With the ban some extinct species are said to have started being seen among the catches from long lines, gill nets and lift nets. The problem is that there is no comprehensive species list for the fishery that would help in continued evaluation, monitoring and up-dating the status of biological integrity of the lake. Studies to establish indicator species for assessing ecological change due to over-fishing are especially important to guide resource management and allocation in Lake Tanganyika.

Many individuals in the villages like Mwamgongo believe that the banning of beach seining has impoverished the villages. As pointed out above, historical data does not support this contention. The main reason is inherent in the structure of the fishing economy itself. For a long time the fishing industry in villages like Mwamgongo was not only controlled by people from outside the villages, its very motive force was from markets in Burundi and the DRC. The recent political upheavals in the two neighbouring countries have disintegrated the market. The positive aspect of the situation is that it has slackened the exploitation of the fishery in many villages. Return to political stability in the two countries will most likely rejuvenate the fishing villages' economy and probably bring the levels of fishery exploitation to a point higher than experienced prior to the upheavals. How such a reversal of events would affect the integrity of this fishery's biodiversity is, however, difficult to assess.

As already noted environmental problems related to fishing activities include deforestation due to fish processing. The problem is growing and needs immediate attention. However, the type of plant species most used in fish processing, their spread in the ecosystem, their biodiversity value and their alternative uses are yet to be properly documented.

### ***6.2.2 People's perception and attitudes on biodiversity within the fishery***

It has been noted above that so long as one important specie such as **Dagaa** is abundant fishermen may not be able to notice changes in the abundance of other fish species. Local awareness raising on this issue seems important once it has been established that there is indeed a decline in the abundance of fish within and between species. Furthermore, no research has been done on the values people put on different fish species and fisheries. The socio-cultural and economic values of different fish species are not properly documented. It would also be of interest to determine the extent to which the type of fish eaten by one social group is a socio-economic indicator of the status of the families of that group.

### ***6.2.3 Impact of agriculture and mining on the biodiversity***

As already observed, in the Highland Zone of Kasulu District where the three main rivers (Malagarasi, Ruchugi and Luiche) which feed into Lake Tanganyika originate the agricultural system is settled. However, the poor red soils necessitate the keeping of large herds of cattle not only as a means of accumulation and insurance for bad times but also as a vital complement to crop production through the use of farmyard manure. Unfortunately, often

cattle keeping also results in overstocking and the related problems of soil compaction and soil erosion which are visible in all villages in the catchment. Nevertheless, no study has so far comprehensively documented how much of the sediments generated in this Zone actually reach and affect the biodiversity of the lake.

In the Intermediate Zone the agricultural system is based on shifting cultivation in the natural miombo woodland. There is relatively little integration of livestock keeping and crop production in the zone as historically cattle mortality due to the tsetse fly has prohibited livestock keeping. Use of inorganic fertilisers is also minimal due to their being unaffordable after the removal of government subsidies. Furthermore, access to extension services is limited. Consequently, more land is cleared farther into the miombo woodlands, effectively intensifying the deforestation of the woodlands. Deforestation resulting from expansion of agricultural activities and overgrazing due to an influx of livestock from Sukumaland and growth of local livestock numbers are also major environmental threats in Mpanda and Sumbawanga Districts. To date, however, no study has related these threats to the perceived degradation of the biodiversity in the lake.

#### ***6.2.4 Status of protected areas and their role on biodiversity maintenance***

The studies done in the Tanzanian side of the Lake Tanganyika catchment reveal that the Forest Reserves are facing considerable pressure from deforestation due to timber production, fuelwood collection, and agricultural expansion for flue-cured tobacco growing in Mpanda District. Poaching was also said to be rampant in the Game Reserves. Initially, FRs managed by the districts were established for the purpose of maintaining resources for sustainable utilisation. However, the latter day objective of generating revenue has undermined the aim of sustainability. This is becoming more evident under the Local Government Reform process.

In general the District Councils which are self-funding agencies lack the capacity for managing and supervising extraction from local authority FRs and other public land. Shortage of manpower, lack of funds, lack of transport and other equipment exacerbate the problem of natural resource use regulation and control. As a result the majority of such reserves are degraded and subject to encroachment by the local communities and commercial extractors of timber, charcoal and wildlife (Olsen *et al.*, 1999:5). Although rough estimates indicate that about 18% of the FRs has been destroyed actual rates of destruction and consequent loss of biodiversity are yet to be quantified. So is the relationship between such FR degradation and the loss of biodiversity in Lake Tanganyika.

### **6.3 Proposals for possible future interventions**

#### ***6.3.1 Improvement of fishing gear and techniques***

It has been pointed out that many fishermen considered their fishing gears too old and technologically out-dated to be as profitable as they could wish. The trend in the near future, assuming that the problems of piracy and political upheavals in high waters and neighbouring countries, respectively, stabilise will probably be that traditional catamarans will be abandoned for the bigger and more expensive Apollo catamarans. This means that if the government does not intervene to regulate fishing in Lake Tanganyika and national banks and lending institutions in Rukwa and Kigoma do not support local investment in fishing the new fishing fleets may belong to neighbouring countries' investors. The problems of losing ownership are illustrated by the case of the fledgling economy of Mwamgongo village.

### ***6.3.2 Improvements in palm oil production***

Palm oil processing currently experimented by poor women in various villages offers a temporary respite to the lakeside communities' economy and provides a possible long term diversification niche. As already pointed out, with some technological improvements and vigorous trade promotion this economic activity could turn out to be a major money spinner in many a coastal village along Lake Tanganyika. It has been documented, though, that once cottage industries are improved they tend to change ownership, with the poor owners losing to the rich who buy them out. Special safeguards for the poor women currently engaged in the activity should, therefore, be put in place before any improvements to this industry are envisaged.

### ***6.3.3 Access to financial resources through NGOs and CBOs***

It has been noted that other sources of livelihoods the people in the coastal area depend upon include business, livestock keeping, and beer brewing; the general make up of which differ from one village to another. In bigger villages like Kirando there are businesses characteristic of urban areas while in other villages these are fairly small businesses selling basic household items. Ease of entry, low capitalisation, and lack of credit have constrained their capacity for capital formation.

As far as environmental conservation is concerned, there are several institutions that have shown willingness to offer aid packages to the people of the area. Such institutions in Rukwa include the Rukwa Association of Non-Governmental Organisations (RANGO) which offers small loans as seed money to various local economic groups. The other institution is the International Fund for Agricultural Development (IFAD) which has recently helped the local Department of Agriculture with working tools (including the much needed transport facilities) and technical know-how. Other institutions include GTZ (whose involvement is concentrated in issues of food and nutrition), and the World Food Programme which gives out small loans to help simple animal husbandry in some areas. There is also a revolving Women's Development Fund provided for by the Government of Tanzania.

The problems, which face many of the people who have been getting loans from these institutions, include delayed repayment and/or non-repayment of such loans. These problems have come about because a majority of the people who get these loans invest them in agriculture which is fraught with problems of poor technology and unpredictable weather. Those who invest in fishing claim that business is currently not certain. Catches have declined as buyers have increased and the market is unpredictable and very competitive. Market fluctuations send many small business people out of business.

Except for such institutions as the international NGOs Care International, Africare Tanzania, and others which apart from servicing the refugees also offer some financial resources for the development of local communities very few institutions have shown willingness to offer substantial aid packages to the people of Kigoma Region. The Mahale Mountain National Park has attempted to help the villages adjacent to it with building of classes, teachers' offices, dispensary wards, et cetera, through its Community Conservation Service (CCS). But as much as TANAPA's CCS, is geared towards coaxing local communities to accept management responsibilities and benefits, augurs well for the future of natural resources conservation in Tanzania, observations indicate that despite presently addressing these developmental issues, the CCS approach does not address the immediate contentious issues such as inadequacy of arable land, pastures and water. The reason for this may be that as conservationists TANAPA staff are trained to approach these issues strictly from a

conservationist perspective. Such a perspective does not accommodate approaches which assume consumptive use of national park resources (IRA, 1999).

Apart from TANAPA's initiative, TACARE is also already working with the people in some villages in Kigoma District. Investment has been made in tree seedling development and afforestation, and in educational sponsorship for girls unable to pay their way through secondary school (A. Kingu, pers. comm.).

#### ***6.3.4 Environmental and sanitation facilities improvement***

Generally, the communities visited during the PRA studies are aware of the necessity of having good sanitary conditions. Although the quality of the facilities differ greatly between and within villages at least every homestead has a pit latrine. Despite this diarrhoeal and worm infections are only second to malaria as the main health hazard in the area, and all of the most common diseases are either waterborne or originate from use of contaminated water. The problem lies with the unboiled water people use for domestic purposes. As already observed, many people in the area know about the need to boil their drinking water, but they do not do so because of a perceived shortage of fuelwood in many villages, and that people think boiled water does not taste good. Some of the villagers have the fatalists belief that "death does not come by cholera alone" (E. Ntirugelegwa, pers. comm.). Undoubtedly, environmental educators have a vital role to play in changing these attitudes. First the environmental educators will have to consider problems such as: how to reach the men who do not accompany their spouses to dispensaries/health centres with the health and sanitary knowledge they need to improve their environments and sanitary conditions. Special efforts need to be made by health and environmental educators to include men.

#### ***6.3.5 Improvement of village governance***

The main development problem in villages with a large number of immigrants/refugees like Sunuka is lack of good governance. These villages have been the centre of human population increase due to settler and refugee immigration from the DRC that has caused not only socio-economic problems but also cultural conflicts which cause disharmony among the communities. The immigrant communities in Kalilani, Sunuka, and other such villages are in search of a homeland in these villages. They say they and their fathers were born here. They believe they have a right to this place like any other citizen. They demand to get equal opportunities to vote and be voted for. As illustrated at Banyamalenge (eastern DRC) the indigenous communities are disputing this demand by the immigrants.

This struggle has instigated disharmonious political alignments in some of these villages. For example, in an attempt to carve a niche for themselves in the political arena of the lakeshore community of Sunuka, the immigrants paralysed the 1999 Local Government elections in the village. Currently there is no government in the village. Unfortunately, the situation is being exacerbated by ambitious and unscrupulous local individuals who stand to gain economically and/or politically from this conflict. In many such villages these struggles have resulted in a political stalemate and general feelings of despondency among the indigenous communities. The Central Government has to resolve this situation if these communities are to develop sustainably.



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